



Flying Operations

**★AIRCREW, WEAPONS DIRECTOR, AND TERMINAL ATTACK
CONTROLLER PROCEDURES FOR AIR OPERATIONS**

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AAFP 11-2, *Flight Rules and Procedures*, and provides procedures for air-to-air and air-to-surface operations and training. It applies to aircrews, weapons directors (WD), and terminal attack controllers (TACs) tasked with the tactical missions listed in AFM 1-1; *Basic Aerospace Doctrine of the USAF*. It applies to the following MAJCOMs: Air Combat Command (ACC), Air Education and Training Command (AETC), Air Force Special Operations Command (AFSOC), Air Mobility Command (AMC), Air National Guard (ANG), US Air Force Reserve (USAFR), Pacific Air Forces (PACAF), and US Air Forces Europe (USAFE). Send comments and suggested improvements on AF Form 847, Recommendation for Change of Publication, through channels, to HQ ACC/DOTW, 205 Dodd Blvd. Suite 101, Langley AFB VA 23665-2789.

SUMMARY OF REVISIONS

In addition to numerous wording changes and minor re-definitions, the following areas have been added or revised: weapons director and terminal attack controller responsibilities; single-ship operations; Knock-It-Off/Terminate procedures; large exercise guidance; night air-to-air training rules; Night Vision Goggle operations; Combat Search and Rescue procedures; helicopter training rules; airlift aircraft maneuvering categories; training with initial trainer aircraft; joint live fire guidance; bomber exercise coordination guide; live missile firing communications; and aircrew/terminal attack controller coordination guide.

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Chapter 1**INTRODUCTION****1.1. General Information:**

1.1.1. Purpose. This instruction provides procedures for air-to-air and air-to-surface operations, and training for those missions listed in AFM 1-1, *Basic Aerospace Doctrine of the USAF*.

1.1.2. Responsibilities Assigned. Aircrew may perform operations or procedures not specifically addressed in this instruction only if they enhance safe, effective mission accomplishment. This instruction is not a substitute for sound judgment or common sense.

1.1.3. MAJCOM Responsibilities. MAJCOMs may change, delete, or add procedures, as applicable, to this instruction, but must ensure changes are no less restrictive than the basic instruction. If supplemented, MAJCOMs must send one copy each to HQ USAF/XOCE and HQ ACC/DOTW.

1.1.4. Waivers . Send waiver requests to this instruction to appropriate MAJCOM DO/XO for approval. MAJCOMs will forward copies of all approved waivers to HQ ACC/DO. Mission directives will specify waivers and exercise directors will provide briefings to all participants on waivers before conducting associated activities.

1.2. Scope. This instruction prescribes unclassified procedures for the execution of both operational and training missions. To the maximum extent possible this instruction publishes generic procedures applicable to all aircraft. Effective use of this instruction comes from a sound knowledge of current tactics and operational procedures found in the following sources:

- AFI 11-206, *General Flight Rules*.
- AFI 13-212, *Training Weapons Ranges*.
- AFJI 36-2220, *Joint USAF/USA/USN/USMC Air Combat Training*.
- AFSOCI 11-202, *C-130 Operations*.
- AFSOCMAN 11-1, *Tactical Employment* (Special Operations)
- AFSOCR 55-18 (or joint equivalent), *Helicopter Operations*.
- AFSPCI 11-201, *Helicopter Operations*.
- MCI 11-MDS Volume 1 series, *Aircrew Training*.
- MCI 11-MDS Volume 3 series, *Combat Aircraft Operational Procedures*
- MCM 3-1, *Mission Employment Tactics* (classified).
- MCM 3-3, *Combat Aircraft Fundamentals* (unclassified).
- MCMAN 11-211, *Airlift Tactical Employment - C-5, C-17, and C-141* (classified).
- MCMAN 11-212, *Mission Employment Tactics, Tanker Fundamentals, KC-10A, KC-135E/R/T* (U).
- Operations Plans (OPans) and Operation Orders (OPords).
- Phase Manuals and Training Syllabi.

1.3. Air Force Missions. This instruction addresses those Air Force missions and specialized tasks defined in AFM 1-1.

1.4. Training. The missions in AFM 1-1 provide the basis for constructing realistic training scenarios. Except where noted, the procedures in chapter 2 through chapter 4 of this instruction apply during operational missions as well as training scenarios. Specific rules and procedures applicable only to training are in chapter 5 and chapter 6.

1.5. Definitions. The glossary of terms at attachment 1 provides definitions for most terms applicable to air operations and training. Other pertinent definitions are:

- Operational Brevity Words. Succinct phrases or individual words used to convey a more complex message in a tactical environment. MCM 3-1 volume 1, and MCM 3-3 series publish US Air Force brevity words.
- Training Rules (TR). Peacetime rules, procedures, and standards governing air-to-air and air-to-surface training that, when violated, jeopardize flight safety.
- Special Instructions (SPINS). Restrictions, procedures, and scenario elements applicable to specific scenarios, missions, or exercise.
- Rules of Engagement (ROE). Specific constraints applicable to operational real-world peacetime, wartime, or contingency mission employment. OPlans, Contingency Plans, or other operational documents will publish ROE. Specific ROE may include, but are not limited to, political considerations, tactical restrictions, engagement or weapons employment criteria, and any other procedures constraining employment.

1.6. Distribution. Supply a copy of this instruction for each aircrew, WD, and TAC, or as per MAJCOM guidance.

Chapter 2

GENERAL OPERATIONAL AND TRAINING PROCEDURES

2.1. General Information. This chapter provides general procedures applicable to air-to-air and air-to-surface scenarios for both operational and training missions. Chapter 3 through chapter 6 outlines specific mission procedures.

2.2. Philosophy. Successful mission accomplishment demands effective coordination among all participants to include command authorities, controlling agencies, friendly surface-to-air sites, and airborne weapons systems. OPlans and OPords will provide the foundation for this coordination.

2.3. General Aircrew, WD, and TAC Responsibilities:

- Use the procedures in this instruction.
- Be familiar with the capabilities and limitations of communications, control facilities, and other weapons systems employed for mission accomplishment.
- Review the daily Air Tasking Order (ATO), Airspace Control Order (ACO), and any other source available for all missions affecting the assigned area of responsibility (AOR).
- Understand the states of alert, readiness, warning, and ROE within the operational commands' areas of responsibility.
- Know and comply with authentication procedures.
- Know the characteristics and capabilities of the threat.
- Know the tactics described in appropriate tactics manuals. Employ as the tactical situation dictates.
- Know and comply with theater or region airspace control procedures to include Minimum Risk (Safe Passage) procedures, free fire zones, location of known Surface-to-Air Missile (SAM) sites, recovery airfield status, etc.
- Know and comply with local operating procedures, TRs, or ROE.
- Know the responsibilities and procedures associated with the assigned AOR.

2.4. Initial Check-in and Recovery Procedures. Aircrew will check-in with the controlling agency as described below, unless restricted. If required for Operations Security (OPSEC) or Communications Security (COMSEC) omit some or all of the following calls.

2.4.1. Initial Check-in

2.4.1.1. Aircrew will check-in with the following:

- Call sign.
- Authentication as required.
- Deviations or aborts affecting mission accomplishment.

2.4.1.2. The WD, Forward Air Controller (FAC), TAC, or Enlisted TAC (ETAC) will accomplish the following:

- Authenticate as required.
- Provide the aircrew with working frequency or net, and Time-of-Day (TOD) (if applicable).
- Provide a brief situation update ("PICTURE").
- Indicate negative radar contact (if applicable).
- If equipped with Identification Friend or Foe/Selective Identification Feature (IFF/SIF), conduct an IFF/SIF check and advise aircrew of status.

- Pass information pertinent to mission accomplishment. Do not pass information already in the ATO/ACO unless it requires special emphasis.
- Transfer control to working WD (if applicable).

2.4.1.3. The mission, the mission briefing, or the ATO/ACO may require additional information upon check-in, such as:

2.4.1.3.1. Information pertinent to mission accomplishment that was not included in the ATO.

2.4.1.3.2. Air-to-Air Armament. Available armament, in rounds (except gun), using the following (or command directed) brevity, words:

- RADAR - Radar guided weapons.
- HEAT - Infrared guided weapons.
- GUN - Gun with ammunition.

2.4.1.3.3. Air-to-Surface Armament.

2.4.1.3.4. Fuel Status. Pass fuel status by indicating the amount of playtime in minutes the flight has above “BINGO” fuel. (e.g., “VIPER, PLUS 50”)

2.4.2. Recovery. The type of conflict and theater of operations will determine controlling agency priorities and the urgency of recovering aircraft.

2.4.2.1. During recovery, aircrews will contact the controlling agency with the following:

- Call sign and recovery base. If available for commit, transmit “PLAYTIME.”
- Mission results and intelligence consistent with operational command requirements and COMSEC procedures.

2.4.2.2. The WD will, as conditions require:

- Provide recovery instructions including base status.
- Copy and relay in-flight reports.
- Assist in Minimum Risk (Safe Passage) procedures.
- Accomplish hand-off to recovery agency.

2.5. Degrees of Control:

2.5.1. General Information

2.5.1.1. OPODs and OPlans, command authority, ROE, commit criteria, and force commander’s directions govern commit authority. Commit authority rests with the flight lead and the WD. The commit must be a team effort between the flight lead and the WD, and may be initiated by either the flight lead or the WD. In circumstances where the aircrew initiates a commit, the flight lead will inform the WD and provide target location. When informed of a commit, the WD will check to ensure that it is on an appropriate target and assist as necessary. To terminate the commit, the WD will transmit “SKIP IT” and appropriate directions. The “SKIP IT” call is directive: aircrews will disengage unless the flight lead has situational awareness (SA) of targets or formations that threaten the flight. In this case, the flight lead will transmit “UNABLE” and continue the intercept.

2.5.1.2. Figure 2.1 shows the Continuum of Control grouped into five levels: close, tactical, broadcast, advisory, and autonomous. There is no correlated format of target information to level of control. SA is the determining factor of where an aircrew or WD might be along the continuum. Transition between levels of control may, as the situation dictates, occur rapidly and continuously throughout a mission. The continuum allows maximum use of both aircrews’ and WDs’ SA while minimizing missed weapons opportunities due to a more rigid or fixed control structure.

Figure 2.1. The Continuum of Control.

Close Control	Tactical Control	Broadcast Control	Advisory Control	Autonomous Operation
Target and commit information provided to specific flights		Target information provided but not to specific flights	Radar target information not available and not provided	Communications not available and no information or control passed
Command vectors guide aircrew to intercept	Aircrew responsible for tactical positioning			

2.5.1.3. Within the control continuum there are certain aircrew and WD responsibilities common to all levels. For the aircrews these include:

- Position the aircraft or flight as necessary to accomplish the mission.
- Acknowledge target information as the situation permits.
- Notify the WD if lost contact occurs on a committed target.

- Call previously unreported contacts.
- Report essential elements of information (EEI).
- Report mission results.
- Advise the WD of flight status.

2.5.1.4. WD responsibilities include:

- Provide a situation brief (“PICTURE”) as time permits.
- Define commit objective (“KILL” or “ID”).
- Provide threat and potential threat information (numbers, formation, altitude, heading, speed).
- Commit aircraft on the highest priority target.
- Monitor the intercept or engagement and provide vectors and/or bearing and range to the target in the event the aircraft loses contact.
- Monitor area of responsibility for new targets, and, when necessary, skip the current intercept and recommit aircraft to higher priority targets.

2.5.2. Close Control. Close control requires the greatest degree of WD participation in the execution of intercepts and fighter positioning. The mission will dictate the use of Close control and the aircrew initiates Close control using the transmissions “GO CLOSE CONTROL” or “VECTOR” (if requiring vectors only).

2.5.3. Tactical Control. Tactical control enables the maximum use of aircrew and WD radar SA to accomplish the mission. The WD is not responsible for vectors or intercept geometry. Tactical control provides the aircrew with target information and a commit objective. It’s the standard employment level for the execution of operational and training missions.

2.5.3.1. Aircrews will structure communications to support SA of all participants. To support subsequent executions, keep the WD informed of status and intentions. Call sign usage is critical to mission success.

2.5.3.2. WDs will keep aircrews informed on all situations affecting their mission or execution through clear, concise communications.

2.5.4. Broadcast Control. Broadcast control is a means for WDs to support air operations in a covert, saturated, or low SA environment. It is informative and not directive in nature. WDs pass target information by referencing a designated location or grid system, and not addressing specific flights or aircrews.

2.5.5. Advisory Control. Advisory control is a radio monitor mode used when the controlling agency loses radar capability. Maintain communications either directly, through a radio relay, or through another agency or facility.

2.5.5.1. Aircrews operating under advisory control will call “CONTACT,” “COMMIT,” and “ENGAGED” (including target location) to enhance coordination among fighters on the same frequency and to keep the controlling agency informed.

2.5.5.2. To indicate that advisory control is in effect the WD will transmit “MIDNIGHT, MIDNIGHT” and then pass available information.

2.5.6. Autonomous Operations. Autonomous operations occur when the aircrew cannot receive information or guidance from the controlling agency. During autonomous operations that are not preplanned, both the aircrew and WD will attempt to re-establish communications. WDs should not attempt contact during engagements, unless essential.

2.6. Communications:

2.6.1. General Information:

2.6.1.1. Operational Brevity Words in MCM 3-1 volume 1, MCM 3-3 series, and MCMAN 11-211 are the baseline for communications brevity. Applicable publications or the ATO may contain other codewords.

2.6.1.2. When directing a flight, refer to the appropriate flight or element leader for passing information under tactical or close control. A split wingman may require a separate call.

2.6.1.3. Participating aircrews and WDs will monitor Guard frequency to the maximum extent possible.

2.6.1.4. Employ secure/jam-resistant communications systems consistent with the mission scenario.

2.6.2. Close Control and Tactical Control:

2.6.2.1. The following prioritized information applies to close and tactical control:

2.6.2.1.1. Fighter Call Sign.

2.6.2.1.2. Objective (“KILL” or “ID”). Once acknowledged, do not repeat the objective unless it changes.

2.6.2.1.3. Target Position:

- Bearing and Range. Pass bearing in three digits (e.g., “ZERO-NINE-ZERO” for 090 degrees), and range in whole numbers (e.g., “TWENTY-TWO” FOR 22 NM). WDs will transmit “ESTIMATE” if unable to accurately determine target information.
- Reference system. Provide target information relative to a reference (e.g., bullseye, geographic point, grid reference, or latitude and longitude).

2.6.2.1.4. Target Altitude:

- Specific altitude in feet.

- Altitude bands as defined in MCM 3-1, Volume 1 (e.g., “LOW,” “MEDIUM,” “UNKNOWN,” etc.).
- 2.6.2.1.5. Flight size and formation. Using brevity words as defined in MCM 3-1, Volume 1 (e.g., “MANY,” “FEW,” “LINE ABREAST,” etc.).
- 2.6.2.1.6. Target heading and tactical maneuvering observed. Pass heading as a cardinal direction (e.g., “NORTH,” “SOUTHWEST”). Transmit tactical maneuvers with clear, concise terms.
- 2.6.2.1.7. Threat type or role, if known.
- 2.6.2.1.8. Other significant observations.
- 2.6.2.2. Besides the above information, the WD will pass the following during close control:
 - Heading: “VECTOR XXX” (three-digit heading).
 - Altitude: “CLIMB/ DESCEND/ MAINTAIN ANGELS XXX” (three digit flight level).
 - Intercept geometry to be flown.
 - Turn direction: “LEFT” or “RIGHT.”
- 2.6.3. Broadcast Control:
 - 2.6.3.1. Use the following prioritized information during broadcast control:
 - Track designation, if used by the operating command. Also transmit target type if able.
 - Reference system in use (geographic, bullseye point, or grid reference).
 - If using geographic or bullseye reference, provide bearing and range from reference point to target.
 - Target heading.
 - Estimated number of targets.
 - 2.6.3.2. The ATO will publish grid charts and grid center point listings. Information will be the same as for broadcast control, but the area designator and grid subsector replace bullseye information. Figure 2.2 shows a sample grid.

Figure 2.2. Sample Grid.

1	2	3
4	A B 5 C D	6
7	8	9

2.6.4. Situation Brief. A situation brief consists of real time information pertinent to a specific mission. Information will concisely describe enemy, unknown, and pertinent friendly activity in the area of operations. Aircrews will request a situation brief by transmitting “Call Sign, Bogey Dope.”

2.7. Training Rules (TRs). This section provides TRs applicable to both air-to-air and air-to-surface training. Chapter 5 (air-to-air), chapter 6 (air-to-surface), and command specific supplements provide specific TRs.

2.7.1. G-Awareness Exercise. Fly G-awareness exercises, as defined in MAJCOM-specific volumes, for the following circumstances:

- For aircraft requiring a G-suit, anytime aircrews plan or are likely to maneuver above five Gs during the mission.
- For aircraft not requiring a G-suit, anytime aircrews plan or are likely to maneuver above four Gs during the mission.

2.7.2. Single-Ship Operations. Units may fly single-ship missions if specifically tasked to employ as single-ships. Units not specifically tasked to employ as single-ships may schedule single-ship missions to meet specific training requirements. The squadron flying supervisor (SOF for AFRES and ANG) will be prebriefed on and will approve single-ship operations. These rules also apply to any single-ship operations required by a MAJCOM approved formal syllabus or alternate missions resulting from fallout. For additional air-to-air restrictions see section 5.2.12. For additional air-to-surface restrictions see section 6.3.4.

2.7.3. Knock-It-Off (KIO) and Terminate Procedures:

2.7.3.1. To direct aircraft to cease tactical maneuvering, use the terms “KNOCK-IT-OFF” or “TERMINATE.” Call “KNOCK-IT-OFF” when safety of flight is a factor, where doubt or confusion exists, and to knock-off an entire large force scenario. In a large force (e.g. Flag-level exercise) scenario, aircrews may terminate a local engagement for reasons listed in sections 2.7.3.3 and 2.7.3.5 below which do not affect the entire large force scenario. Make directive radio calls if danger is imminent. Aircraft with radio failure will signal KIO with a continuous wing rock. Another aircraft observing a continuous wing rock will transmit “KNOCK-IT-OFF” and provide required assistance. Call “TERMINATE” to direct a specific aircraft or flight to cease tactical maneuvering and to proceed as briefed or directed. Use “TERMINATE” when safety of flight is not a factor.

2.7.3.2. When hearing a “KNOCK-IT-OFF” call or observing a continuous wing rock, all participating aircraft will:

- Clear flight path.
- Cease tactical maneuvering.
- Climb or descend to a prebriefed safe altitude (1000 feet AGL minimum, 300 feet AGL minimum for helicopters).

- Acknowledge with call sign or a wing rock. Obtain verbal clearance before resuming maneuvers.
- 2.7.3.3. Knock-It-Off Situations. Transmit “KIO” when any of the following situations occur:
- A dangerous situation is developing.
 - Loss of situational awareness (SA).
 - A violation of any of the following has occurred or appears imminent: area boundaries, minimum cloud separation, minimum altitude, or minimum range.
 - Weather below minimums.
 - Engaged aircraft exceeds maneuvering limits such that safety of flight is compromised.
 - Recognized radio failure.
 - Observing a continuous wing rock.
 - BINGO fuel inadvertently overflowed and fuel state requires traffic priority or direct routing to primary or alternate recovery base.
 - Any player calls “KNOCK-IT-OFF.”
 - Unbriefed or unscheduled flight enters the working area and is detrimental to the safe conduct of the mission.

NOTE: In this situation, contact the appropriate controlling agency and attempt to determine the aircraft’s identity and intentions (if known). Monitor the aircraft through the controlling agency and/or onboard radar until it is no longer a factor. While maintaining separation, assume the unidentified aircraft is equipped with Traffic Alert and Collision Avoidance System (TCAS), and maneuver so as not to create a Resolution Advisory warning and/or follow-on evasive action.

2.7.3.4. When hearing a “TERMINATE” call, all participating aircraft will:

- Clear flight path.
- Cease tactical maneuvering.
- Acknowledge with call sign.
- Proceed as briefed or directed.

2.7.3.5. Terminate Situations. Transmit “TERMINATE” when any of the following situations occur:

- Reaching BINGO fuel.
- Desired learning objective is achieved.
- Stalemate.
- Any player calls “TERMINATE.”

2.7.4. Communications Jamming (Comm Jam) Procedures:

2.7.4.1. Exercise directors will brief procedures to all personnel directly associated with comm jam missions (aircrews, WDs, jammers) to include jam free and safety frequencies, and lost comm procedures. Accomplish comm jam only in tactical training areas.

2.7.4.2. Preface all transmissions required for safety (e.g., weather changes, airspace advisories, etc.) with “SAFETY, SAFETY.” Upon hearing this call all jammers on the frequency will cease jamming to allow the transmission.

2.7.4.3. Call “KNOCK-IT-OFF” to terminate both comm jamming and maneuvering.

2.7.4.4. Any person employing communications spoofing will not use terms with safety implications, e.g., “KNOCK-IT-OFF,” “CHATTER-MARK,” or “SAFETY” as communications jamming tactics.

2.7.4.5. Do not conduct jamming on Guard or any predesignated safety frequency.

2.7.4.6. Do not comm jam during the following activities:

- Aerial refueling.
- Actual personnel or cargo air drops.
- Aircraft in distress.
- Actual Search and Rescue (SAR) missions.
- Operational (non training) missions.
- VIP flights (unless pre-approved by exercise director).

2.7.4.7. Publish techniques for instituting chattermark procedures in the ATO or OPlan, when required. Commands will establish chattermark procedures for regular training use and for their areas of responsibility. Employ these procedures only if other means to counter communications jamming have failed.

2.7.5. Chaff, Flare, and Smokey Devil Procedures:

2.7.5.1. Arm Chaff, Flare, and Smokey Devil systems only in an approved area with an intent to dispense.

2.7.5.2. Smokey Devil or Flare Employment:

2.7.5.2.1. Restrict original manufacture Smokey Devil employment to government owned or controlled property (overwater warning areas are included). Minimum employment altitude is 500 feet AGL.

2.7.5.2.2. Aircrews may employ flares when operating over government owned or controlled property (over water warning areas included) using the following minimum altitudes:

- No fire hazard: No minimum altitude.
- Fire hazard: According to applicable MAJCOM MDS-series directives or range orders.

2.7.5.2.3. Aircrews may employ flares and Value Engineering Change Proposal Smokey Devils (VECP SD) in a non-government owned or controlled training areas (i.e., Military Operation Areas (MOA)) only if the training area has an approved AF Form 813, Request For Environmental Impact Analysis. VECP SD minimum altitude for employment is 300 feet AGL.

2.7.5.3. When employing chaff, refer to AFR 55-44 (soon to be published as AFI 10-701, *Performing Electronic Countermeasures in the U.S. and Canada*).

2.7.5.4. For specific air-to-air procedures see section 5.2.9.8.

2.7.6. Day, Night, and Civil Twilight Procedures. Use day rules and procedures (operational and training) during civil twilight (defined in the air almanac maintained by base weather). Use night or weather procedures when adverse conditions exist during civil twilight. Without access to the air almanac, consider civil twilight to be 30 minutes before sunrise until sunrise, and from sunset until 30 minutes after sunset.

2.7.7. Overland-Overwater Transition. When transitioning from overland to overwater, or when over terrain without attitude references, aircrews will ensure they are in a level or climbing flight attitude to anticipate a reduction in visual cues. The intent is to maintain spatial orientation primarily through use of visual cues with instrument cross-checks as a backup.

2.7.8. Transition to low altitude (N/A for helicopters). Maximum dive angle for maneuvering below 5,000 feet AGL is the lesser of 45 degrees or one percent of your AGL altitude (e.g., 40 degrees nose low at 4,000 feet AGL, 30 degrees nose low at 3,000 feet AGL, etc.). Reduce dives starting above 5,000 feet AGL to 45 degrees or less before passing 5,000 feet AGL. MAJCOM guidance, -34 series TOs, the tactical situation, the weather, and this instruction will dictate planned weapons delivery maximum dive angles.

2.8. Night Training Rules. This section adds additional night TRs applicable to both air-to-air and air-to-surface night training (see chapters 5 and 6 for additional rules). For AFSOC assigned/gained aircraft and aircraft operated under AFSOC lead command guidance, see AFSOC publications. The provisions of this chapter apply with the following additions:

2.8.1. Minimum Altitude. The minimum altitude at night is the minimum safe altitude (MSA) for the area or route. LANTIRN aircraft may operate below the MSA with an operational Terrain Following (TF) system and according to applicable - MAJCOM MDS-series regulations. EF-111s may operate below the MSA according to MAJCOM guidance. Bomber and airlift/rescue aircraft (with or without NVGs) may operate below the MSA according to MAJCOM MDS-series guidance. NVG-equipped fighter aircraft may operate down to 1000 feet AGL during high-illumination (HI) periods. The flight lead is responsible for determining in-flight illumination level. Low-illumination (LI) minimums (MSA) will be used when low visibility/cloud cover/lack of artificial illumination prevents preplanned HI minimums.

2.8.2. Night Maneuvering Limits:

2.8.2.1. Only LIMITED and CONTROLLED maneuvering are authorized at night. Helicopters are restricted to LIMITED maneuvering during night air-to-air and surface-to-air engagements only. Do not conduct threat reactions below the MSA or outside the lateral confines of the area protected by the MSA. If NVG equipped and HI conditions exist, minimum altitude for threat reactions is 1000 feet AGL. Minimum altitude for helicopter threat reactions is 100 feet AGL.

2.8.2.2. Use TF system limits for all threat reactions below the MSA (including offensive actions) only with a confirmed engaged and operational TF system. Conduct all threat reactions below the MSA within TF system limits. If NVG-equipped, aircrews may discontinue TF and use NVG minima.

2.8.3. TF Below the MSA. When below the MSA and outside TF limits, the pilot in control of the aircraft will place sole attention on safely reestablishing TF limits with TF indications adequate to continue safe low-altitude operations. Crewmembers not actively engaged in flying the aircraft may operate low-altitude sensors while outside TF limits.

2.8.4. Minimum Airspeeds. LANTIRN aircraft will maintain a minimum of 400 KIAS or aircraft specific MAJCOM MDS-series minimum, whichever is greater, during TF operations in mountainous terrain. Minimum airspeed for B-1s and EF-111s will be according to the associated performance manuals and aircraft specific MAJCOM MDS-series guidance.

2.8.5. Avionics Use. Aircrews will set an initial 1,000 feet AGL (800 feet AGL for B-52) Set Clearance Plane (SCP) before initiating a lower SCP. If so equipped, aircraft operating on NVGs will set avionic systems to allow adequate altitude warnings for either high or low illumination conditions.

2.8.6. TF in IMC. TF operations in IMC will be according to aircraft specific MAJCOM guidance.

2.8.7. System Failures. Failure of any portion of the TF system or HUD/FLIR/NVG imagery during low altitude operations requires an immediate climb to or above the appropriate minimum altitude. Return to TF or NVG operations only after regaining safe TF/NVG operations according to aircraft specific MAJCOM MDS-series guidance/NVG operating procedures.

2.8.8. Night Lighting and Illumination

2.8.8.1. Aircraft Lighting Category Definitions (Note: These definitions do not relieve aircrews from complying with FAA aircraft lighting restrictions).

- Normal lighting: Night lighting as directed in aircraft operating procedures.
- Reduced lighting: Normal night lighting reduced to minimum approved by the FAA.
- Covert lighting: Night lighting visible through NVGs but not visible to the naked eye.
- Blacked-out lighting: All external lights off.

2.8.8.2. Illumination Levels.

2.8.8.2.1. High Illumination (HI) is defined as a minimum of 2.2 millilux illumination derived from natural or artificial sources (unless defined otherwise in aircraft specific MAJCOM MDS-series instructions).

2.8.8.2.2. Low Illumination (LI) is defined as less than 2.2. millilux (unless defined otherwise in aircraft specific MAJCOM MDS-series instructions).

2.8.8.2.3. In aircraft not equipped with inflight illumination measuring devices, the flight lead or individual pilot is the final determining authority to assess actual illumination for a particular mission element, based on visibility and terrain features/resolution.

2.8.8.2.4. Some missions may switch between HI and LI depending upon weather, moon rise/set, artificial illumination, etc. Aircrews may transition between HI and LI operations with the appropriate change in restrictions and limitations.

2.8.9. NVG Mission Planning and Operational Considerations.

2.8.9.1. Mission Planning (Also refer to appropriate MAJCOM publications).

2.8.9.1.1. NVG pre-mission planning will be accomplished using a DOD-approved light level planning program.

2.8.9.1.2. If ambient illumination is low and artificial illumination is planned to enhance the mission, a backup “no flares/artificial illumination” option will be briefed.

2.8.9.1.3. All flights will plan LI and no-NVG back-up options (N/A for helicopters).

2.8.9.1.4. All aircrew will carry an NVG-compatible flashlight and a spare NVG battery (in addition to visor-mounted batteries) during NVG sorties. Aircrews will carry chemical light sticks unless backup cockpit lighting is NVG compatible.

2.8.9.2. Operational Considerations.

2.8.9.2.1. When only a portion of participating aircraft are NVG-equipped, interflight deconfliction will be accomplished using visible lighting or positive altitude/area deconfliction. All aircraft will halt reduced, covert, or blacked-out lighting operations when a “knock-it-off” occurs until positive separation of aircraft is ensured.

2.8.9.2.2. Failure of any portion of the NVGs requires an immediate transfer to instruments and establishment of non-NVG VFR or IFR procedures. Resume NVG operations only after correcting the NVG malfunction.

2.9. Scenario Changes. Before the “FIGHT’S ON” call, exercise directors, mission commanders, and flight leads will notify and receive acknowledgment from all aircrews and WDs for any scenario changes that affect safety of flight, in any exercise or engagement (e.g., airspace changes, weather in working area, block changes, etc.).

2.10. Exercises . The following instructions apply to major exercises including Flags, Operational Readiness Inspections (ORI), surges, and composite force training (CFT) exercises:

2.10.1. Special Instructions (SPINS). Exercise directors publish and brief SPINS unique to their exercise.

2.10.2. Qualifications. Commanders will ensure only properly qualified and current aircrews and weapons controllers participate in exercise taskings.

2.10.3. Briefing Requirements. Exercise directors will brief participants unfamiliar with this instruction to ensure they know and understand the TRs. Exercise directors will also publish modifications to TRs in the exercise planning document to accommodate differences in TRs.

2.10.4. Pre-Mission Briefings

2.10.4.1. Pre-mission briefings will include the applicable portions of the Training Rules (TRs) and exercise SPINS. For Flag exercises, the Red Force mission commander briefs the applicable TRs/SPINS during the Blue Force mass briefing and in turn to all Red Force participants.

2.10.4.2. A squadron or wing supervisor (flight commander or higher), weapons officer, or Inspector General (IG) representative will conduct daily telephonic mission briefs with participating units in exercises when operational constraints make it impractical for face-to-face briefings. This supervisor does not need to be flying in the mission, but must be a fully knowledgeable exercise participant.

2.10.4.3. Exercise directors will publish TRs in the exercise planning document when daily briefings are not possible because units are operating from several different locations.

2.10.5. Minimum Cloud Clearance During Flag Exercises. The exercise director determines the extent of air-to-air participation when a ceiling is a factor, and may allow a reduced number of Red Force air-to-air participants below the ceiling to engage Blue Force air-to-surface participants. The exercise director may also reduce the vertical cloud separation beneath a ceiling to 500 feet (1,000 feet when above 10,000 feet MSL) when accomplishing all the following:

- Restrict Blue Force air-to-surface participants to remain within the surface to 1,000 foot AGL block (except for weapons delivery),
- Restrict Blue Force air-to-air participants from operating below the ceiling, and
- Terminate communications jamming.

2.10.6. Separation of Aircraft. Exercise directors and mission commanders will develop and implement deconfliction plans that provide adequate separation of participating aircraft. Use any combination of time, space (assigning specific geographical areas to flights), or altitude blocks to deconflict participating aircraft.

Chapter 3

TACTICAL MISSION PROCEDURES

3.1. Introduction. This chapter delineates procedures for specific tactical missions listed in AFM 1-1. Detailed considerations for the execution of various tactical missions are found in MCM 3-1, Volume 1.

3.2. General Information:

3.2.1. Mission Change. Air-to-air capable aircraft on an air-to-surface mission may divert to an air-to-air operation upon completion of the primary mission. Their employment in the air-to-air role hinges on operational command guidance and the tactical situation.

3.2.2. Command and Control Agencies. The controlling agency will provide, when able or desired, radar monitoring services enroute to the control or orbit point, and give information on target weather, altimeter settings, significant changes to the Air Order of Battle (AOB), and Electronic Order of Battle (EOB). If required, the controller will also assist in multiple flight join ups to form an attack force. Command and control agencies will provide divert information or other directions to attack forces in response to real-time requirements.

3.2.3. Rendezvous. Mission commanders will attempt to arrange a preplanned rendezvous. When unable, or should delays occur, the mission commander or flight leader of the delayed flight will advise the WD of a need for rendezvous assistance.

3.2.4. State of Alert. There are three progressive states of alert that an operational command can modify or expand on:

- Alert. Aircrews on alert will become airborne within the time specified by operational command directives.
- Battle Stations. Aircrews will be in the cockpits and will be capable of starting engines and becoming airborne in the minimum practical time. Units will develop procedures to keep the aircrew advised of potential target and threat information.
- Runway Alert. Aircrews are in the cockpit with appropriate checks complete. Aircraft are on or near the runway with engines running, ready for takeoff.

3.2.5. Alert Launch Procedures:

3.2.5.1. Scramble Order. A scramble order requires the aircraft to become airborne within the time specified by the operational command. Units will implement mandatory scramble procedures if less than optimum conditions exist at an airbase. A mandatory scramble is one that directs aircraft to scramble regardless of conditions at the base. Operational commands will establish mandatory scramble parameters and designate mandatory scramble authority. As a minimum the scramble order will contain the following:

- "SCRAMBLE," prefaced by "MANDATORY" if applicable, and amplified as required (i.e., "ACTIVE AIR," "EXERCISE," "PRACTICE," or "SIMULATED").
- Call signs.
- Initial Vector or Profile. This will be a cutoff vector to expected target position or vector to the operating area, accounting for normal scramble delay.
- Altitude.
- Speed. Aircrews will perform a technical order climb and cruise at optimum cruise speed unless directed otherwise. Use the term "BURNER" to indicate an afterburner climb or acceleration to maximum speed.
- Controlling agency and radio frequency.

3.2.5.2. Airborne Order. The airborne order requires the aircraft to become airborne at a specified time. The format of an airborne order is the same as for a scramble, using the term "AIRBORNE ORDER" instead of "SCRAMBLE," and specifying a takeoff time.

3.2.5.3. Flush. A flush is a mass launch usually employed when the airfield or area is subject to imminent attack. Launch all aircraft as soon as possible. Establish local procedures for this type of launch.

3.3. Offensive Counterair (OCA):

3.3.1. General Information. Two basic missions, air-to-surface and air-to-air, comprise OCA. The roles of force protection and sweep further divided air-to-air OCA. The key to an effective OCA mission is coordination between all assets involved. The WD will prepare to advise all flights of force status before rendezvous and to provide assistance, if necessary, during the rendezvous. Where equipment limitations or enemy activity restricts control to only one of the forces, the primary mission flights and escort may be on the same frequency, when tactically sound.

3.3.2. Air-to-Surface OCA. MCM 3-1, Volume 1 and the MDS specific volumes contain specific mission details. When tasked to operate with air-to-air assets, mission commanders will ensure adequate coordination. Use MCM 3-1, Volume 1 considerations as a guide. Escorted air-to-surface flights can anticipate threat information according to section 3.3.3 below.

3.3.3. Air-to-Air OCA:

3.3.3.1. Force Protection. WDs will provide "PICTURE" information relative to the escort flight lead or as detailed in the ATO. Pass all threat warnings, for both the escort and the primary force, to the escort. To aid plans for disengagement and egress, the WD will provide the escort with updates on the status and location of the primary force. The WD will also provide the primary force with the status of the escort. Threat warnings continue to be important to both forces. The WD must be ready to provide vectors back to the primary force after escort engagements to maximize protection of the primary force.

3.3.3.2. Sweep. Use tactical control unless COMSEC, OPSEC, or phase of the mission dictate otherwise. If altitude or range from the controlling site causes a loss of radar contact, the WD will revert to broadcast control. During a covert sweep, the WD will monitor and develop situation awareness of the mission ingress.

3.4. Defensive Counterair (DCA):

3.4.1. WDs and aircrews with adjacent areas of responsibility must coordinate with each other to prevent inadvertent multiple commits on the same target and to ensure coverage of defended areas.

3.4.2. WDs will situate fighters based on available resources, the defensive objective, OPords or OPlans, fighter and weapon system capabilities, armament loads, expected threat numbers, threat types, location, and terrain features.

3.4.3. Aircrews and WDs must maintain awareness of time, fuel, and armament remaining to ensure an orderly flow of replacements and to provide continuous coverage.

3.4.4. During peacetime air defense activities the primary level of control is "Close" (see section 2.5.2). The WD will direct the aircrew to position the aircraft at a fixed altitude, and vector to facilitate mission execution. Aircrews and WDs will comply with Air Traffic Control (ATC) constraints, and avoid international boundaries or other regions. However, if no such considerations or constraints exist, the WD will allow the fighter to select an altitude commensurate with optimum mission planning. Operational commands will determine peacetime air sovereignty procedures used in their theater or area of operations.

3.5. Close Air Support (CAS):

3.5.1. Effective CAS hinges on close coordination, good communications, and thorough mission planning. Expeditious hand-off of the attackers to the FAC/TAC/ETAC is critical. Radar support varies depending on other tasking and mission factors.

3.5.2. Preplanned FAC and Attacker Rendezvous. Mission commanders may arrange for a preplanned rendezvous. When unable or when delays occur, the mission commander or flight leader of the delayed flight must advise the WD of their need for rendezvous assistance.

3.6. Air Interdiction (AI). AI missions are generally covert in nature and usually receive only flight following by C3 agencies. When integrated with other assets such as escort, coordination must occur to maximize mission potential.

3.7. Reconnaissance. Unarmed reconnaissance aircraft must get advanced threat warning. Often beyond radio and radar range, reconnaissance missions require continued monitoring to allow quick response upon reestablishing contact.

3.8. Suppression of Enemy Air Defenses (SEAD). This mission will normally augment other air-to-surface missions in the same area. Mission success hinges on timely suppression and coordination with attackers. When working with SEAD missions, the WD will:

- Coordinate integration between SEAD aircraft and attack flights to ensure timely suppression of threats.
- Pass previous EOB information when required.
- Augment degraded, destroyed, or saturated command and control agency (CCA) elements and when required, provide command and control in support of SEAD missions in conjunction with AOC/ABCCC.

3.9. Combat Search and Rescue (CSAR)

3.9.1 CSAR missions usually require the coordinated effort of a variety of combat and support aircraft. The initial aircraft with the most situational awareness on a downed aircrew is the On-Scene Commander (OSC). Usually, this is the downed aircraft's flight member until relieved or bingo. OSC should attempt the following actions:

- Locate and protect the survivor(s).
- Authenticate the survivor(s).
- Evaluate the threat to the survivor and CSAR forces.

3.9.2 The aircraft in the position to best coordinate and marshal forces to execute the CSAR mission is the Airborne Mission Coordinator (AMC). AWACS will usually assume this role. In the absence of AWACS, ABCCC can perform this mission. The AMC should attempt the following actions:

- Locate the survivor(s)
- Divert or scramble CSAR alert forces
- Divert or scramble force protection assets
- Ensure CSAR and follow-on forces have sufficient tanker assets for an extended rescue effort

3.9.3 Refer to AFDD 34, Combat Search and Rescue Operations, for specific guidance on roles and responsibilities of USAF personnel supporting Combat Search and Rescue (CSAR) operations. Included in this document is on-scene commander (OSC) responsibilities, as well as procedures for Combat Search and Rescue Task Force (CSARTF) participants.

3.10. Combat Aerial Delivery . Combat Aerial Delivery refers to all services airlift aircraft provide to the theater CINC (including theater airlift, airdrop, tactical airland, combat re-supply, aeromedical evacuation and special missions) from an airlift point of embarkation to a point as close as practicable to the user's specified final destination, under fire if necessary.

Chapter 4

AERIAL REFUELING PROCEDURES

4.1. General Procedures:

4.1.1. References. Refer to applicable aircraft Technical Orders (TO), TO 1-1C-1, specific aircraft MAJCOM MDS-series directives and this instruction for air-refueling procedures.

4.1.2. Communication. This instruction, MAJCOM supplements, and service directives establish communication procedures between tankers and receivers.

4.1.3. IFF and SIF. Display appropriate IFF and SIF modes and codes during rendezvous except during Emission Control (EMCON) Options 3 (if directed) or 4. This requirement applies to the lead aircraft (or aircraft designated by the leader) of a formation. Place IFF and SIF systems to standby mode after rendezvous is complete.

4.1.4. Fuel Management. Manage fuel distribution according to theater and local directives. Make air refueling off-loads according to the applicable ATO or refueling schedule.

4.2. Low Altitude Refueling. Do not conduct low-altitude refueling in areas of:

- Forecasted severe icing
- Reported moderate to severe icing
- Forecasted severe turbulence
- Forecasted moderate or greater turbulence in mountain wave effect
- Reported moderate or greater turbulence

4.3. Tanker Abort. The tanker will inform the receivers and radar unit if it experiences problems preventing it from completing the air refueling. The WD will assist as necessary to the aircrews involved. The tanker aircraft commander will ensure aircraft separation and inform the receiver and WD of intentions.

4.4. Receiver Procedures. Conduct air-refueling procedures according to applicable aircraft air-refueling TOs and aircraft specific MAJCOM MDS-series directives.

4.5. Tactical Considerations and Communications Options:

4.5.1. Air-Refueling Altitude and Speed. Alter receiver or tanker airspeed and altitude based on the particular situation to include type receiver, ordnance load, weather, and other tactical considerations. In some scenarios pre-strike refueling will occur well below optimum refueling altitudes to accommodate heavily loaded aircraft.

4.5.2. Communications During Air Refueling. In a tactical environment effective combat operations require emission control. Use radio silent and emission control (TO 1-1C-1) procedures to the maximum extent possible consistent with receiver aircraft and tanker proficiency, and flight safety. Minimized radio communications between receivers and tankers requires a coordinated planned off load, refueling order, ARCP, ARCT, and end air-refueling point. Tankers and receivers will use the visual signals in the respective air-refueling TOs.

4.5.2.1. Brief all participants in the refueling operation on the type rendezvous, rendezvous point and time, tanker and receiver altitudes, missed rendezvous procedures, and back-up communications procedures.

4.5.2.2. The ATO will contain the EMCON Option if other than EMCON 2. The ATO will also explain any different options used during different segments of the mission.

4.5.2.3. Use communications as necessary during emergencies or unsafe situations.

4.6. Special Procedures:

4.6.1. Systems Malfunctions. Do not conduct air-refueling when any system malfunction or condition exists which would jeopardize safety, except during fuel emergencies. Attempt to rendezvous the receivers with another tanker if unable to accomplish planned fuel transfer. Divert if the situation dictates.

4.6.2. Lost Wingman Procedures. Follow TO and MAJCOM MDS-series procedures. The WD will assist as necessary to maintain separation between all aircraft.

Chapter 5

AIR-TO-AIR TRAINING

5.1. Introduction. This chapter provides rules that apply to all categories of air-to-air training including: ACBT, surface-to-air threat response, composite force exercises, and live air-to-air weapons employment missions.

5.2. Training Rules:

5.2.1. Briefing and Debriefing Requirements:

5.2.1.1. Accomplish face-to-face briefings for normal day-to-day training. Conduct telephone briefings when circumstances prevent face-to-face briefings or debriefings. Conduct airborne briefings when circumstances prevent face-to-face or telephone briefings, and only when tactically sound. MAJCOMs will authorize alternate briefing procedures for unusual circumstances.

5.2.1.2. As a minimum, face-to-face and telephone briefings will cover the items in the air-to-air coordination and briefing guide in attachment 2. Also use this guide for pre-mission message formats. For aircrew, weapons director (WD), and AWACS coordination guides see attachments 3 and 4.

5.2.1.3. Flight debriefings will critically assess mission execution and offer solutions to problems encountered.

5.2.2. Airspace:

5.2.2.1. Conduct training within designated airspace. Both aircrews and WDs share joint responsibility in avoiding lateral spill-outs. It is the aircrews' responsibility to avoid vertical spill-outs.

5.2.2.2. Accomplish supersonic flight only in designated supersonic areas.

5.2.3. Communications. Basic procedures are in chapters 2 and 3. The following additional procedures apply to air-to-air training:

5.2.3.1. Aircrews will acknowledge all WD airspace and safety related calls.

5.2.3.2. WD procedures:

5.2.3.2.1. Advise the aircrews of the bearing, range, heading, and altitude (if available) of previously unreported aircraft within 10 miles that are a potential hazard.

5.2.3.2.2. Advise the aircrews when the controlling agency cannot support a minimum of broadcast control. In this situation complete an attack only if the aircrew can provide safe separation.

5.2.3.2.3. Advise the aircrews of when they approach airspace boundaries.

5.2.3.2.4. Provide other pertinent information (e.g., airspace changes, weather in working area, system degradation, etc.).

5.2.3.2.5. Make "CHECK FUEL" advisories, when appropriate, to assist aircrews in fuel awareness.

5.2.3.2.6. Unless prebriefed to the contrary, make the following calls:

- Vectors to position aircraft for initial setups.
- Advise aircrew of Minimum Safe Altitude (MSA).
- A range call at 10 NM from any merge.

5.2.3.3. Use separate frequencies for opposing forces provided:

- WDs or ACMI RTOs have simultaneous monitor and broadcast capability on each working frequency or a dedicated communication link exists between controllers and participating aircraft.
 - WDs or ACMI RTOs will immediately pass all Knock-It-Offs, Terminates, and safety of flight information to all participating aircraft.
- 5.2.4. Explosive Chaff. Use of explosive chaff in air-to-air training is subject to the following conditions:
- Specifically brief all participants on the use of explosive chaff.
 - Aircraft will only dispense explosive chaff when the fighter range is 1 NM or greater, or the fighter attacks from above and remains above the aircraft dispensing explosive chaff.
 - Chaff dispensed from an ALE-28, ALE-40, ALE-45, ALE-47, and XM-130 is not considered explosive chaff.
- 5.2.5. Aircraft Configuration:
- 5.2.5.1. Configurations. Configurations will be according to MAJCOM and service directives, individual aircraft regulations, and aircraft TOs.
- 5.2.5.2. External Lighting. Aircraft may operate without exterior lighting if meeting all the following conditions:
- Approval of the wing or group commander.
 - In approved airspace.
 - Have appropriate waivers to applicable directives (i.e., AFI 11-206, *General Flight Rules*, FARs, etc.).
- 5.2.5.3. Live External Air-to-Air Missile Carriage:
- 5.2.5.3.1. Do not fly with live air-to-air missiles in peacetime, except under the following circumstances:
- Air defense alert aircraft.
 - Air defense aircraft during changeover sorties.
 - Weapon System Evaluation Program (WSEP), and Operational Test and Evaluation (OT&E) programs.
 - Aircraft flown following generation exercises.
 - As authorized by MAJCOM/DO (or equivalent), service directives, or OPlan tasking.
- 5.2.5.3.2. The following requirements apply to authorized carriage of live external air-to-air missiles for other than WSEP firings:
- Aircrews will make a “WEAPONS SAFE” call upon initial check-in and before each setup following a KIO or terminate. Check the master arm switch in the SAFE, SIM, OFF, or equivalent position, and use the weapons panel or Head Up Display (HUD) to verify the “Weapons Safe” position.
 - Do not use the terms “HOSTILE” or “KILL” at anytime.
 - Do not squeeze or depress the trigger or pickle button.
 - Specific requirements in MAJCOM or service directives.
 - See section 5.2.8.4 for maximum maneuvering category with live air-to-air missiles.
- 5.2.5.4. Gun Employment:
- 5.2.5.4.1. To prevent inadvertent firings when simulating gun employment ensure the following:
- Have no ammunition loaded or safe the gun according to MAJCOM MDS-series or service directives.
 - Perform a trigger check (trigger squeeze) before simulated gun employment.
- 5.2.5.4.2. To simulate missile employment with a gun that cannot be safed, accomplish all of the following:
- Load no live missiles.
 - Place the master arm switch in the SAFE, SIM, OFF, or equivalent position.
 - Verify the weapons panel or HUD display in the SAFE position.
 - Do not squeeze the gun trigger.
- 5.2.5.5. Air-to-Air Laser Employment:
- 5.2.5.5.1. Eye Safe Laser Setting. Laser-equipped aircraft may use an eye safe laser setting (1.54 microns) at any time. Aircrew Laser Eye Protection (ALEP) is not required.
- 5.2.5.5.2. Combat Laser Setting. Laser-equipped aircraft are prohibited from using a combat laser setting (1.06 microns) during peacetime training missions except in the following circumstances:
- WG/CC specifically approves A/A laser operations for a specific training exercise, test, or WSEP.
 - Approved ALEP will be worn by all participants.
 - Lasing aircraft will cease laser use within 2 miles of another manned aircraft.
 - Unit will contact and abide by current guidelines established by Armstrong Lab (AL/OEO), Brooks AFB, TX.
- 5.2.5.5.3. Use of the combat laser in an A/A mode during contingency operations or combat will be governed by in-theater directives.
- 5.2.6. Fuel Requirements:
- 5.2.6.1. Establish fuel minimums for each mission according to MAJCOM MDS-series or service directives.
- 5.2.6.2. Perform an “Ops Check” before the first engagement and before every re-engagements after a “KIO” or “Terminate.”
- 5.2.7. Maneuvering Categories. This section provides maneuvering categories for aircraft during air-to-air training missions. For additional restrictions:

- Bomber aircraft see section 5.3
- Airlift aircraft see section 5.4
- Tanker aircraft see section 5.5
- Initial trainer aircraft see section 5.6
- Special ops/rescue aircraft see section 5.7
- Helicopters see section 5.8

5.2.7.1. **UNLIMITED.** Unlimited is the normal air-to-air training maneuvering category. No restrictions except for MAJCOM MDS-series and flight manual aircraft limits.

5.2.7.2. **LIMITED.** Limited is the normal intercept training maneuvering category. Add the following constraints to MAJCOM MDS-series guidance and flight manual aircraft limits:

5.2.7.2.1. A defender is an aircraft attempting to defeat or deny an adversary's weapons employment. With an attacker behind the 3/9 line, a defender can react with an extension, a separation, a turn not to exceed 180 degrees (level or climbing if at low-altitude), or a wing rock. No maneuvering restrictions apply when the attacker is forward of the 3/9 line.

5.2.7.2.2. Attackers (aircraft simulating air-to-air ordnance and offensively maneuvering) engaging each other have no maneuver restrictions premerge. Attackers will not turn more than 180 degrees, in an attempt to shoot each other, after reaching each other's 3/9 line.

5.2.7.2.3. An attack can continue until:

- A "TERMINATE" or "KNOCK IT OFF" call
- A wing rock
- An achieved kill
- A role reversal
- A defender reaches 180 degree of turn.

5.2.7.3. **RESTRICTED.** Heading changes of up to 60 degrees either side of course.

5.2.7.4. **NON-MANEUVERING.** Maintain constant heading, airspeed, and altitude.

5.2.7.5. **CONTROLLED.** Controlled maneuvering, used in 1 v 1 night visual training, is greater than limited maneuvering but not unlimited. Maneuvers are fluid and continue beyond 180 degrees, but maneuvering options of the defensive fighter are predetermined and restricted to a maximum of 540 degrees total turning. Controlled maneuvering may only be conducted as authorized in applicable volumes of MAJCOM MDS-series guidance. Additional restrictions:

- Above 5000 feet AGL.
- Cloud clearance: same as day unrestricted.
- Visibility: 5 nm minimum.
- Discernible horizon.
- Lunar elevation: above the horizon.
- Illumination: High.
- Maximum participating aircraft: two.
- Visual set-ups only.

5.2.8. **Fixed-Wing Maneuvering Limitations.** This section specifies the maximum maneuvering allowed during air-to-air training based on flight conditions (day, night, or weather), altitude, and configuration. The rules of this instruction, MAJCOM or service directives, or aircraft limitations apply, whichever is the more restrictive. Flight leaders may, if required for training, place further limits on one or both sides of an engagement depending on mission objectives or conditions.

5.2.8.1. **Day, Visual Maneuvering:**

5.2.8.1.1. **Maximum Maneuvering Category: UNLIMITED.**

5.2.8.1.2. **Weather Requirements:**

- 2,000 feet vertical and 1 NM horizontal cloud clearance.
- 5 NM (8 km USAFE) visibility.
- Discernible horizon.

5.2.8.1.3. Minimum altitude is 5,000 feet AGL after the engagement begins (defined as once both opposing aircraft have begun visual maneuvers to achieve or prevent a weapons firing position).

5.2.8.2. **Day, Low-Altitude, Visual Maneuvering:**

5.2.8.2.1. Below 5,000 feet AGL constitutes "low-altitude."

5.2.8.2.2. **LIMITED** is the maximum maneuvering category.

5.2.8.2.3. Weather requirements are the same as section 5.2.8.1.2, Day Weather Requirements.

5.2.8.2.4. Base maneuvering categories on the altitude of the lowest participant in the engagement when the engagement begins. The engagement is a "low-altitude" engagement under any of the following conditions:

- All maneuvering occurs at low-altitude.
- Attacking an aircraft at low-altitude.
- A low-altitude engagement subsequently climbs above 5,000 feet AGL.

- Defensive aircraft reacts prior to low altitude attacker climbing through 5,000 feet AGL.
- 5.2.8.2.5. Upon disengagement, aircraft will extend beyond visual range before reengagement.
- 5.2.8.2.6. Determine minimum altitudes by MAJCOM directives, service directives, personal low altitude minimums, or 1,000 feet AGL overwater, whichever is higher.
- 5.2.8.2.7. Do not perform rolling or exaggerated vertical maneuvering.
- 5.2.8.3. Weather or Night:
- 5.2.8.3.1. LIMITED is the maximum maneuvering category for non-NVG night operations or any NVG-equipped aircrews accomplishing any intercept operation. Controlled maneuvering applies only to NVG-equipped pilots engaged in visual set-up pre-planned maneuvering exercises limited to two participating aircraft for qualification and continuation training.
- 5.2.8.3.2. Weather. Does not meet either cloud clearance, visibility, or discernible horizon requirements specified in section 5.2.8.1.2, Day Weather Requirements.
- 5.2.8.3.3. Night. For night definition see section 2.7.6. During periods approaching sunrise/sunset, zodiacal light must be considered when attempting NVG use. When IR light from a recent sunrise or pending sunset precludes NVG use, attempt to change aircraft heading away from the zodiacal light. If that option is not practical, revert to LI minimums until the sun sets sufficiently for normal NVG use or the sun rises sufficiently for unaided vision. For additional night guidance, see section 2.8.
- 5.2.8.3.4. Coordinate all altitude changes in IMC to ensure aircraft separation requirements.
- 5.2.8.3.5. During night or weather training, minimum altitude will be the minimum safe altitude (MSA) for the area or route, TF limits (see section 2.8), or 1000 feet AGL for NVG operations during HI conditions
- 5.2.8.3.6. Include frequent flight instrument cross-checks during all engagements. Consider aircrew experience and desired learning objectives when selecting altitude splits between attackers and defenders.
- 5.2.8.3.7. No “visual-only” commits or Judys. For NVG-equipped aircraft, visual-only commits are authorized if a discernible horizon exists and target line-of-sight (LOS) motion is observed and range/altitude separation is perceptible. If no target LOS motion is observed, instrument/sensor target range (other than NVG visual perception) is required for conversions and/or pure pursuit fighter positioning.
- 5.2.8.3.8. No “visual-only” air-to-air training for non-NVG equipped aircraft (NVG-equipped aircrews refer to section 5.2.7.5).
- 5.2.8.4. Carrying Live Air-to-Air Ordnance. During live weapons employment missions, refer to the applicable maneuvering limits in paragraphs 5.2.8.1, 5.2.8.2, or 5.2.8.3. With no intent to employ live air-to-air missiles, maximum maneuvering category is LIMITED. See section 5.2.5.3. for additional requirements.
- 5.2.9. Separation of Aircraft:
- 5.2.9.1. Assign hard altitudes or altitude blocks to provide vertical separation for nonvisual setups. Require a minimum of 1,000 feet vertical separation (500 feet vertical separation below 5,000 feet AGL) between altitude blocks. Helicopter versus helicopter engagements may use separation of 200 feet.
- 5.2.9.2. Aircraft may not transit or enter the altitude or altitude block of any adversary unless at least one of the following conditions apply:
- Adversary is beyond 10 NM.
 - Adversary is within 10 NM, but not a conflict (i.e., collision potential) based on situation awareness (SA).
 - Establishing visual contact.
 - Fighter verbally confirms adversary’s hard altitude and maintains required vertical separation.
 - Fighter is performing practice VID procedures according to Attachment 5 or as supplemented.
- 5.2.9.3. Determine positive lateral separation by geography, through timing, through onboard systems, or by GCI or AWACS.
- 5.2.9.4. Each participant must use “see and avoid” techniques to ensure a clear flight path, especially while entering and leaving engagements. Aircrews should use visual contact, onboard systems, AWACS or GCI, situation awareness, and other aids to clear the area. If during visual setups loss of visual or tally occurs, establish positive separation until regaining visual contact. Any attacker losing sight will maneuver away from the defender’s last known position. Defenders will maneuver predictably if loss of sight and SA occurs. Only when the attacker can ensure separation from the trailers, can the attacker perform rear quarter attacks against the leaders of a lead-trail formation.
- 5.2.9.5. Aircrew can not rely on altitude blocks to guarantee separation once any participant initiates visual maneuvering. After a “TERMINATE” or “KNOCK IT OFF” call, all participants will return to assigned altitude blocks while clearing their flight paths.
- 5.2.9.6. Establish and maintain a minimum of 1,000 feet (500 feet if below 5,000 AGL) altitude separation from other friendly aircraft or friendly flights within 10 NM unless SA allows, or the flights deconflict attacks by space or time.
- 5.2.9.7. Do not maneuver aircraft inside minimum range of an opposing aircraft. If a violation of minimum range appears imminent or has occurred, each aircraft will perform a “KNOCK-IT-OFF/TERMINATE,” clear its flight path, cease tactical maneuvering, and re-establish required minimum range. Minimum range is MAJCOM or service directed.
- 5.2.9.8. Attackers will prepare for defenders to release countermeasures at anytime when operating in a chaff, flare, or smokey devil environment. The possibilities of aircraft and chaff, flare, or smokey devil collision increases significantly as the attacker

approaches gun range. Attackers must avoid dead six o'clock approaches and break off all attacks with out-of-plane maneuvers.

5.2.9.9. When two aircraft approach head-on, each will clear to the right unless maneuvering to do so would result in crossing flight paths. Aircraft with the higher nose position will attempt to go above the opponent, energy state and altitude permitting.

5.2.9.10. Participants will cease weapons employment (actual or simulated) under the following conditions:

- Pure pursuit head-on missile attacks before 9,000 feet slant range (3000 feet for helicopter versus helicopter).
- Any gun attack exceeding 135 degrees aspect.
- Target aircraft begins an air-to-surface delivery maneuver.
- Airspeed drops below minimum maneuvering airspeed.

5.2.10. Flight Composition. A tactical unit possessing unlike fighters with an integrated mission (e.g., Offensive Counterair (OCA), Wild Weasel) may, when tactically sound, employ as mixed elements.

5.2.11. Single-Ship Operations. Air-to-air qualified flight leads may fly single-ship air-to-air training missions according to section 2.7.2. Pilots who are not air-to-air flight lead qualified, may fly single-ship air-to-air training missions according to section 2.7.2 and the following restrictions:

- Having briefed single-ship operations as a primary or alternate mission.
- The pilot is MR or MC. If the pilot is IQT/MQT, then an instructor or squadron supervisor is required in the aircraft.
- LIMITED maneuvering only during the mission. NOTE: Single-ships may use UNLIMITED maneuvering if there is an air-to-air qualified flight lead flying one of the participating aircraft.

5.2.12. Air-to-Air Mutual Support Requirements: Mutual support is essential to effective tactical operations. Training programs will stress employment of two or four-ship flights, and multiples thereof. Fly three-ship employment as described in MCM 3-1 and single-ship flights as authorized in paragraphs 5.2.12 and 2.7.2 only when tactically sound.

5.3. Operating Procedures for Training Conducted With Bomber Aircraft. This section applies to all echelons of participating commands and to all agencies under the operational control of HQ ACC. In addition, these procedures apply to other services and foreign services with joint training agreements. The information and TRs in this chapter apply with the following exceptions and additions:

5.3.1. Special Procedures: Only conduct air-to-air training with armed aircraft (bomber or fighter) under the following guidelines:

- The participants' wing or group commanders approve the training.
- Fighter aircrews will be MR or MC.
- Fighters will adhere to the live air-to-air ordnance TRs in this chapter.

5.3.2. Training Rules (TRs).

5.3.2.1. Minimum range during operations with bomber aircraft is 500 feet or MAJCOM and service minimum, whichever is greater.

5.3.2.2. Fighter aircrews undergoing mission qualification training (MQT) will only participate in air-to-air with bombers when with a supervisor flight lead or instructor.

5.3.2.3. Bomber defensive maneuvers during all fighter activity will be UNLIMITED, except when restricted by section 5.2.8 or the following criteria:

5.3.2.3.1. Defensive maneuvers will not exceed aircraft limitations for speed, altitude, and bank angle.

5.3.2.3.2. During operations at or below 500 feet AGL maximum bank angle is 30 degrees.

5.3.2.3.3. Bomber aircraft will not conduct UNLIMITED defensive maneuvers without at least one receiver capable of full azimuth detection and display of fighter interceptor(s). Without full azimuth detection capability, conduct LIMITED maneuvers, but only after establishing a tally with the attacking aircraft and keeping the tally throughout maneuvers. If the bomber does not have a tally on the attacker, the bomber may perform nonaggressive check turns in an attempt to establish a tally.

5.3.3. Ground ECM Environment Exercise.

5.3.3.1. A Ground ECM Environment Exercise provides joint aircrew and WD training in a simulated threat environment. The training involves Region/Sector Air Operations Centers (RAOC/SAOC) directing intercept aircraft against bomber aircraft who are employing ECM techniques to defeat the intercept. The exercise includes both ECM and air-to-air training, and may be conducted in conjunction with each other or individually within a designated Training Area (TA).

5.3.3.1.1. Upon receipt of clearance from the RAOC/SAOC, the bomber may employ maximum electronic countermeasures against ground based EW/GCI, acquisition, or communications covering a designated TA. Dispense chaff, during the training period, only when the RAOC/SAOC coordinates and approves a chaff clearance.

5.3.3.1.2. The radar facility may employ any or all ECCM techniques, fixes, and equipment to counter ECM activity within authorized frequency bands, within scheduled mission restrictions, and according to AFR 55-44 (soon to be published as AFI 10-701, *Performing Electronic Countermeasures in the US and Canada*).

5.3.3.1.3. Bomber aircrew will contact the RAOC/SAOC controlling the TA, 15-45 minutes before the IP. See Attachment 7 for coordination information.

5.3.3.1.4. After positive identification and handover from ATC to the faker monitor, faker will vector bomber aircraft within the assigned airspace for the duration of the training period. To maximize use of all training aircraft, use IFF and SIF positive target control (PTC) programs. This system provides discrete tracking and improved safety control of adversary aircraft in the radar environment, regardless of ECM degradation to search and HF radars. Primary responsibility for safety rests with the faker monitor. Disregard the PTC requirement only when not conducting ECM activity against the control facility.

5.3.3.1.5. Drop chaff according to procedures in AFR 55-44 (AFI 10-701) and this instruction. The RAOC/SAOC authorizing chaff and flare drops will record time and call sign of the aircraft receiving the clearance.

5.3.3.2. Communications:

5.3.3.2.1. The bomber aircrew is responsible for notifying the RAOC/SAOC if there is an air abort, or any changes from the planned IP or IP times.

5.3.3.2.2. The bomber unit command post must notify the RAOC/SAOC concerned of changes if there is a ground abort.

5.3.3.2.3. The RAOC/SAOC responsible for activity will notify the remaining participants or units, of all cancellations or ground aborts,

5.3.3.2.4. Conduct FAA and ICAO communications on UHF when possible. Use FAA and ICAO communications when out of UHF range, and use USAF HF aeronautical stations according to FLIP.

5.3.3.3. ECM Clearances:

5.3.3.3.1. Make ECM notifications and clearance according to AFR 55-44 (AFI 10-701). Bomber aircrews will contact an RAOC/SAOC to obtain clearance to conduct electronic warfare training. Except for joint exercises and evaluations where blanket ECM clearances are pre coordinated, obtain specific chaff clearance when requesting ECM clearance. Confirm chaff clearance even when chaff has been pre-coordinated. This clearance does not relieve the aircrew of the responsibility to obtain other

clearances required by AFR 55-44 (AFI 10-701).

5.3.3.3.2. If the radar facility called does not have air defense jurisdiction, over the requested area, for the ECM clearance, it will request conduction of the ECM activity to the appropriate radar facility.

5.3.3.3.3. Relay confirmation of the ECM clearance and permission to conduct the EW activity to the aircrew requesting the activity.

5.3.3.3.4. A restricted geographical area clearance as defined in AFR 55-44 (AFI 10-701) does not constitute authority to conduct in-flight ECM until obtaining a clearance from the appropriate radar facility.

5.3.3.3.5. AFR 55-44 (AFI 10-701) designates all reference to ECM frequency bands and channels in the conduct of electronic warfare operations.

5.3.3.4. Scheduling. For day-to-day training activity use direct coordination between ACC, AFRES, and ANG wings or groups and participating air defense regions, sectors, squadrons, and wings. Coordinate special missions with NAFs and air defense regions/ sectors for scheduling and coordinating training.

5.4. Operating Procedures for Training Conducted With Airlift Aircraft. This section applies to all echelons of participating commands and to all agencies under the operational control of MAJCOMs with airlift aircraft. In addition, these procedures apply to joint training agreements with other services and foreign services. The provisions of this chapter apply with the following exceptions and additions:

5.4.1. Training Rules:

5.4.1.1. Minimum range during operations with airlift aircraft is 1,000 feet or MAJCOM and service minimum, whichever is greater.

5.4.1.2. Weather Criteria and Maneuvering Limits:

5.4.1.2.1. Limit standard airlift formation flights in day VMC to a maximum maneuvering category of LIMITED, with a maximum 60 degrees of bank.

5.4.1.2.2. Night. Airlift aircraft will adhere to a RESTRICTED maneuvering category with a maximum 30 degrees of bank and no altitude change. Do not conduct night air-to-air training against airlift formation flights.

5.4.1.2.3. IMC. Conduct air-to-air training in IMC only with RWR equipped airlift aircraft. All aircraft must maintain continuous communications. Limit evasive maneuvering to LIMITED maneuvers with a maximum of 60 degrees of bank and no altitude change. The minimum range for simulated ordnance delivery is 1 NM.

5.4.1.3. Fighter aircrews will be MR or MC before participation in training with airlift aircraft.

5.4.2. Scheduling Activity With airlift units. For day-to-day training activity use direct coordination between airlift wings and participating air defense regions, sectors, squadrons, and wings. Coordinate large scale and long duration exercises through MAJCOM/DO. Send requests for air-to-air training involving live armament to MAJCOM/DO.

5.5. Operating Procedures for Training Conducted With Tanker Aircraft. This section applies to all echelons of participating commands and to all agencies under the operational control of MAJCOMs with tanker aircraft. In addition, these

procedures apply to joint training agreements with other services and foreign services. AFSOC tanker aircraft will adhere to the procedures in section 5.9. The provisions of this chapter apply with the following exceptions and additions.

5.5.1. General.

5.5.1.1. Accomplish training within special use or ATC sanitized airspace (MOA, restricted area, warning area, ATCAA, etc.)

5.5.1.2. Do not conduct air-to-air training against tanker aircraft during IMC conditions.

5.5.1.3. Minimum range during operations with tanker aircraft is 1,000 feet or MAJCOM and service minimum, whichever is greater.

5.5.1.4. Minimum altitude for tanker aircraft is 3,000 feet (5,000 feet at night) above the highest obstacle or terrain within 4 NM of route centerline. Aircrew will compute a hard minimum MSL altitude using the above criteria.

5.5.1.5. Tanker aircraft may operate in the UNLIMITED category but will not exceed 45 degrees of bank (30 degrees in cell formation).

5.5.1.6. Fighter aircrews will be MR or MC before participation in air-to-air training with tanker aircraft.

5.5.2. Composite Force Exercises and Large Scale Training. The following rules apply to air-to-air training where more than 10 aircraft are operating in the assigned airspace. During exercises supervised by Det 1 USAF Air Mobility School, delete the following requirements at the discretion of Det 1 USAF Air Mobility School commander.

5.5.2.1. Tanker aircraft will not depart assigned altitude blocks.

5.5.2.2. Restrict maneuvering to level turns, with bank angle limits as specified in section 5.1.5. Once turns are complete, tanker aircraft may descend within their assigned altitude block.

5.5.2.3. An additional crew member, acting as safety observer, will occupy the IP seat on the KC-135 and the boom operator forward crew seat on the KC-10.

5.5.3. Small Scale Training. The following rules apply to air-to-air training where a total of 10 or less aircraft are operating within the assigned airspace.

5.5.3.1. Tanker aircraft may depart assigned altitude blocks according to section 5.2.9.

5.5.3.2. Restrict maneuvering to level turns, with bank angle limits as specified in section 5.5.1.5. Once turns are complete, tanker aircraft may descend to no lower than the minimum altitudes specified in section 5.5.1.4.

5.5.3.3. An additional crew member, acting as safety observer, will occupy the IP seat on the KC-135 and the boom operator forward crew seat on the KC-10. Units may delete this requirement at the discretion of the squadron commander.

5.5.4. Scheduling Activity With Tanker Units. For day-to-day training activity use direct coordination between tanker wings and participating air defense regions/sectors, fighter wings, fighter squadrons, and air control units. Coordinate exceptions, and requests for air-to-air training involving live armament through the appropriate MAJCOM in section 5.7.1.

5.6. Operating Procedures for Training Conducted with Initial Trainer Aircraft (T-1A/T-37/T-38/T-43). This section applies to all echelons of participating commands and to all agencies under the operational control of HQ AETC. In addition, these procedures apply to joint training agreements with other services and foreign services.

The provisions of this chapter apply with the following exceptions and additions:

5.6.1. Waivers. Request waivers from these procedures through 19AF/DO.

5.6.2. IFF Instructors.

5.6.2.1. The restrictions of sections 5.6.3.2 and 5.6.3.3 below do not apply to T-38 aircraft flown by IFF instructors, upgrading IFF instructors, and other fully qualified IFF pilots.

5.6.2.2. Instructors, upgrading instructors, and other fully qualified pilots of initial trainer aircraft may participate in day, night, and IMC intercept missions provided participation does not impact unit ability to support daily student training.

5.6.3. Training Rules.

5.6.3.1. If fighters will carry live ordnance, initial trainer aircraft may still participate provided the fighters brief/follow the guidance in paragraphs 5.2.5.3 and 5.2.5.4.

5.6.3.2. Initial trainer aircraft will:

- Establish two-way communication with the controlling agency before the intercept.
- Discontinue tactical maneuvering at 10 NM.
- Adhere to LIMITED maneuvering.

5.6.3.3. If GCI is not available for the trainer aircraft, trainers will establish two-way communication with the fighters and fly the briefed, scripted, non-maneuvering profile.

5.6.4. Scheduling. For day-to-day training activity, as well as exercise participation, use direct coordination between AETC wings and participating NORAD regions, sectors, wings, squadrons, and TACS. Complete all coordination before flight. Send an information copy of any fragmentary order involving initial trainer aircraft to 19AF/DOR.

5.7. Operating Procedures for Training Conducted With Special Ops/Rescue Fixed-Wing Aircraft. This section applies to all echelons of participating commands and to all other agencies under the operational control of MAJCOMs with Special Ops/Rescue fixed-wing aircraft. In addition, these procedures apply to training agreements with other services and foreign services. The provisions of this chapter apply with the following exceptions and additions:

5.7.1. Training Rules:

5.7.1.1. Minimum range during operations with AFSOC aircraft is 1,000 feet or MAJCOM and service minimum, whichever is greater.

5.7.1.2. Do not conduct intercepts on AFSOC aircraft during air refueling operations.

5.7.1.3. Do not conduct IMC intercepts on helicopters or any aircraft formation.

5.7.2. Scheduling. For day-to-day training activity use direct coordination between AFSOC units and participating wings or squadrons.

5.8. Operating Procedures for Training Conducted With Helicopters . This paragraph applies to all echelons of participating commands and to all agencies under the operational control of MAJCOMs with rotary wing aircraft when at least one helicopter is participating in air-to-air training. In addition, these procedures apply to other services and foreign services with joint training agreements

5.8.1. Training Rules (TRs).

5.8.1.1. Aircraft Separation.

5.8.1.1.1. Assign hard altitudes or altitude blocks to provide vertical separation for nonvisual setups. A minimum of 500 feet vertical separation is required between altitudes or blocks between fighters and helicopters (200 feet between helicopter altitudes or blocks).

5.8.1.1.2. Minimum slant ranges during all air-to air training between fighters and helicopters is 1000 feet (500 feet between helicopters).

5.8.1.1.3. Aircraft may not enter or transition the altitude or block of an adversary unless one of the following conditions apply:

- Adversary is beyond 10 NM (5 NM for helicopter vs helicopter).
- Adversary is within 10 nm (5 NM for helicopter vs. helicopter), but not a conflict (i.e. collision potential) based on situational awareness.
- Establishing visual contact.
- Helicopter and/or fighter confirm adversary's hard altitude and maintains required vertical spacing.

5.8.1.2. Maneuvering Categories.

5.8.1.2.1. UNLIMITED. No restrictions except MAJCOM MDS-series and aircraft TOs.

5.8.1.2.2. LIMITED. Maneuver restrictions in paragraph 5.2.7.2 apply with the following exception: vertical jinking maneuvers are permissible during a defensive turn down to 100 feet AGL. Immediately before and after defensive/evasive reactions altitude will be according to MAJCOM MDS-series guidance.

5.8.1.3. Maneuvering Limitations.

5.8.1.3.1. Day. All air-to air defensive maneuvering training will occur in day VMC conditions and will adhere to the weather minimums in paragraph 5.2.8.1.2. Maneuver Category for helicopters is UNLIMITED down to 100 feet AGL.

5.8.1.3.2. Night. All night defensive maneuvering training against surface threats will be LIMITED maneuver category and will comply with the appropriate MAJCOM MDS-series weather and altitude minimums.

5.8.1.3.3. Fighter aircraft will remain subsonic during training conducted with helicopters.

5.8.2. Live Weapons Employment. During defensive maneuvering training against surface threats, helicopter aircrews must deconflict live weapons employment with flight and supporting aircraft.

5.9. Operating Procedures for Interservice Air-to-Air Training. AFI 36-2220, *Joint USAF/USA/USN/USMC Air Combat Training* covers Interservice air-to-air training requirements.

Chapter 6

AIR-TO-SURFACE TRAINING

6.1. Introduction. This chapter describes procedures for tactical air-to-surface training. Use the procedures in this chapter along with operational command directives, Air Traffic Control (ATC) regulations, and letters of agreement. These weapons employment procedures provide aircrews and TACs typical procedures for weapons employment under fixed conditions. For additional FTU or MQT restrictions and termination rules see section 6.3.8. Find further procedures for formal course training in the applicable syllabi.

6.1.1. References. AFI 13-212, *Training Weapons Ranges*, ACCR 55-26, Joint Live Fire Training Operations, TO 1-1M-34, *Aircrew Weapons Delivery Manual*, TO 1-1M-34-1, *Aircrew Weapons Delivery Manual* (classified), aircraft specific weapons delivery TOs, aircraft specific MAJCOM MDS-series regulations, and USAFWS instructional texts are primary references for air-to-surface employment theory, planning, techniques, and analysis. Specific training syllabi and MAJCOM MDS-series guidance contain qualification and scoring criteria.

6.1.2. Air-to-Surface Training Missions:

6.1.2.1. Aircrews should practice weapons delivery under varied conditions; however, perform all delivery passes (including jettison passes), whether hot or dry, using live ordnance delivery parameters to include fuse arming, safe escape, safe separation, and flight deconfliction considerations.

6.1.2.2. Avoid populated areas when carrying ordnance.

6.1.2.3. When conducting simulated attacks against off-range or manned targets, with expendable ordnance loaded on the aircraft, confirm arming switches in the OFF, SAFE, SIM, or equivalent positions. Refer to aircraft MAJCOM MDS-series regulations for specific switch settings for aircraft and cockpit configurations. Select off-range targets so that an inadvertent release will not endanger life.

6.2. Authorized Employment Patterns:

6.2.1. Class A Range. Aircraft will fly the same delivery pattern (rectangular, pop-up, etc.); however, aircrews may mix events or delivery modes when using the same target, same type delivery, and if approved by the RCO. Fly radio-silent attacks, random attacks, element tactics, split pop-up attacks, etc., only if permitted by the range orders, if prebriefed, and if approved by the RCO.

6.2.2. Class B and Class C Ranges. Vary delivery parameters between aircraft to accommodate variances in simulated or actual ordnance, experience levels, and tactical scenarios.

6.3. Air-to-Surface Training Rules. See section 6.5 for additional night rules.

6.3.1. Weather Minimums (AFSOC rotary wing aircraft refer to MAJCOM guidance):

- Use a ceiling of at least 500 feet above the highest portion of the bombing pattern or according to MAJCOM MDS-series aircraft regulations, whichever is higher.
- Visibility will be at least 3 NM.
- Daylight bombing events on overwater ranges requires a discernible horizon.

6.3.2. Range Entry:

6.3.2.1. Perform a dry-clearing pass before weapons delivery on Class B/C land or water ranges to ensure the target area is clear of unauthorized persons or vessels. Omit the requirement for the dry-clearing pass if other means can confirm the range is clear (e.g., range personnel, FAC, IG chase aircraft, a departing flight, etc.). Accomplish a dry pass when an aircrew has not been on that range for an extended period of time, and wants to be refamiliarized with the range. See section 6.5.1.5 for additional night restrictions.

6.3.2.2. Range entry does not require a spacer pass; however, if performed, make the spacer pass at an altitude (500 feet AGL minimum) appropriate for target surveillance, on the run-in heading (unless local restrictions or procedures dictate otherwise), and in route or a tactical formation with the wingman or element echeloned opposite the direction of traffic.

6.3.3. Maximum Flight Size. Normally a maximum of four attacking aircraft will be in the range pattern at any one time.

6.3.4. Single-Ship Operations. See section 2.7.2 for additional restrictions.

6.3.4.1. Pilots assigned to OT&E squadrons may fly single-ship low altitude tactical navigation (LATN), air-to-surface test, and pretest missions to meet or prepare to meet test objectives.

6.3.4.2. Aircrews may fly single-ship air-to-surface training missions if expending training ordnance and if meeting the following restrictions:

6.3.4.2.1. Class A Ranges. MR and MC aircrew may perform single-ship conventional and nuclear deliveries. MQT aircrew may perform single-ship conventional and nuclear deliveries only if there is an instructor or squadron supervisor in the aircraft.

6.3.4.2.2. Class B/C Ranges or Off-Range Simulated Deliveries:

6.3.4.2.2.1. When working with a FAC/TAC/ETAC, MR and MC aircrew may perform single-ship diving deliveries (including live ordnance). When working with a FAC/TAC/ETAC, MQT aircrew may perform single-ship diving deliveries (including live ordnance) only if there is an instructor or squadron supervisor in the aircraft.

6.3.4.2.2.2. MR and MC aircrew may perform LATN and single-ship level or climbing deliveries. MQT aircrew may perform LATN and single-ship level or climbing deliveries only if there is an instructor or squadron supervisor in the aircraft.

6.3.4.2.2.3. When using TFR/LANTIRN systems, MR and MC aircrew may perform single-ship Maverick attacks. When using TFR/LANTIRN systems, MQT aircrew may perform single-ship Maverick attacks only if there is an instructor or squadron supervisor in the aircraft.

6.3.4.2.2.4. MQT F-117 pilots may perform navigation and bombing events without a safety chase.

6.3.5. Switch Changes. Range restrictions and tactics permitting, change cockpit switches in wings level flight before the final attack heading.

6.3.6. Minimum Altitudes. See section 6.5 for additional night minimums.

6.3.6.1. Determine minimum release and recovery altitudes by using the fuzing and fragmentation envelopes established in aircraft specific weapons delivery TOs, MAJCOM MDS-series guidance, or this instruction, whichever is higher.

6.3.6.2. In addition to the minimum altitudes established in MAJCOM MDS-series guidance, apply the following minimum altitudes:

- Level Deliveries: 200 feet on an over water range (50 feet for helicopters).
- LAHD: 300 feet on a Class B/C or over water range.
- Nuclear and Radar Events: 200 feet on an over water range.

6.3.6.3. The minimum recovery altitude for off-range simulated weapons delivery attacks will be the minimum altitude published for the airspace, as dictated by fuse arming or safe escape and separation criteria, or according to MAJCOM MDS-series guidance, whichever is higher.

6.3.6.4. Pilots will not descend below their designated low-level category at any time (for example, conventional downwind, approach to a pop-up point), except during final approach for low angle bombing, level bombing, and low angle strafe attacks.

6.3.6.5. For nuclear weapons delivery patterns, use a minimum of 1,000 feet AGL on downwind except when operating with a Terrain Following (TF) or Terrain Avoidance (TA) system.

6.3.7. Abort Criteria. Along with the general criteria set in section 2.7.3 (Knock-It-Off (KIO) and Terminate Procedures), abort the pass and do not release if any of the following situations occur:

- If over water and the discernible horizon or the land-water contrast is lost (except when operating helicopters or aircraft with a TF or TA systems).
- If unable to positively identify the target. Note: Each aircraft's specific regulations define the requirements for identifying a target when using offsets.
- If the aircraft passes below the minimum recovery altitude established in MAJCOM MDS-series guidance, this chapter, or the planned minimum altitude for the event being flown.
- If establishing unsatisfactory entry or release conditions. Note: Abort the pass if the actual dive angle exceeds the planned dive angle by more than 5 degrees (10 degrees if the planned recovery altitude is above 10,000 feet AGL).
- If airspeed drops below minimums specified in appropriate MAJCOM MDS-series regulations.

6.3.8. FTU and MQT Restrictions and Termination Rules:

6.3.8.1. Students will not change targets once initiating roll-in to final.

6.3.8.2. Pop-up Restrictions. FTU and FTS students will observe the following restrictions unless an instructor is in the aircraft. MQT aircrews will observe the following restrictions unless an instructor is in the flight and able to monitor the pattern:

6.3.8.2.1. Terminate a pop-up if the actual pull-up point is inside the planned pull-up point.

6.3.8.2.2. Do not perform element pop-ups.

6.3.8.2.3. Terminate the pass if the roll-in will require less than 15 degrees or more than 90 degrees of turn.

6.3.8.3. LANTIRN. LANTIRN students will only fly direct pops when engaged in syllabus directed training missions.

6.3.9. Delivery Spacing:

6.3.9.1. Use the following to determine minimum spacing on final for training ordnance during level or climbing deliveries:

- Level - Minimum formation deconfliction spacing time for the ordnance simulated or 15 seconds, whichever is greater.
- Climbing - 30 seconds.
- Night - see section 6.5.
- When a delivery that requires target overflight follows a climbing delivery, use bomb time-of-fall from release plus 30 seconds to ensure the second aircraft crosses the target after bomb impact.

6.3.9.2. TO 1-1M-34 will determine minimum spacing when employing live ordnance.

6.3.10. Fouls:

6.3.10.1. Assess a foul for any of the following reasons:

- Violation of flight or range safety.
- If an aircraft passes below the minimum recovery altitude as established in MAJCOM MDS-series instructions or this instruction for the event being flown.
- A double-firing burst versus a single target or strafing past the foul line.
- Lazy recovery from a strafe pass.

6.3.10.2. Aircrews will not perform further deliveries after receiving a second foul on the range. A single dangerous foul, as judged by the RCO or flight leader, will also restrict aircrew from performing further deliveries during that sortie.

6.3.11. Last Pass Procedure. The last strafe pass will be dry unless each aircraft accomplishes an escape maneuver and an immediate turn after recovery. If performing a dry pass, check switches in SAFE, SIM, OFF or a equivalent position before initiating the last pass.

6.3.12. Armament Safety Procedures:

6.3.12.1. After completing weapon events, flight leads will reform their flights and obtain an armament safety check from each flight member.

6.3.12.2. If unable to confirm ordnance expenditure (including night illumination flares) on the range, perform a visual bomb check. The aircrew, RCO, FAC/TAC/ETAC, B-1 Stores Management System (SMS), or another flight member can all confirm ordnance expenditure. If visual confirmation is not feasible (for example, night), follow hung ordnance procedures.

6.3.13. Recovery From Delivery. Execute recoveries from weapons deliveries according to safe escape maneuvers described in the -34 or -25 aircraft specific TOs. These recoveries will observe minimum altitudes consistent with safe escape, fuze arming, and the weapon delivery minimum altitudes established in MAJCOM MDS-series guidance and this instruction. Aircrews are not authorized to perform the safe escape "turning maneuver," which will result in a descending turn after weapon release. If fouled, the aircrew will immediately execute a climbing escape maneuver.

6.3.14. Flight Composition. A tactical unit possessing dissimilar fighters with integrated missions (e.g., Wild Weasel, buddy lasing, etc.) may employ as mixed elements when tactically sound.

6.4. Range Radio Procedures. See section 6.5 for additional night radio procedures.

6.4.1. Radio Contact. Do not expend ordnance on a Class A or Class B/C manned range without two-way radio contact with the RCO or TACP on duty. Aircrew will acknowledge all transmissions by the RCO or TACP.

6.4.2. Range Entry. Before weapons delivery on a Class A range (or when using scoring on a Class B range), flight leaders will confirm the lineup and events. The RCO will confirm range, traffic pattern (when applicable), altimeter setting, and strafe panel (when applicable). The flight lead will read back the applicable range, traffic pattern, altimeter setting, and strafe panel, however, all flight members need only acknowledge (e.g., "Viper 21, Right Range, Left Traffic, 29.92," "2," "3," "4").

6.4.3. Class A Range Standard Radio Calls:

6.4.3.1. Conventional:

- "Call Sign, BASE."
- "Call Sign, UP" (pop-up patterns only).
- "Call Sign, IN" and add "Dry" if appropriate. Without clearance, abort the pass or fly through dry.
- "Call Sign, OFF, DRY" if applicable.

6.4.3.2. Nuclear patterns and conventional bomber racetrack patterns:

- "Call Sign, BASE."
- "Call Sign, FINAL (Event)."
- "Call Sign, OFF (WET or DRY)."

6.4.4. Class B/C Range Standard Radio Calls: Modify radio calls on a Class B or C ranges to suit the tactical situation (for example, communications jamming).

6.5. Night Surface Attack Procedures (see Section 2.8 for additional procedures):

6.5.1. Night Weapons Delivery Patterns. Procedures and publications are essentially the same as those used in daylight operations with some exceptions. At night observe the following additional requirements:

6.5.1.1. Turn position lights to full intensity, and the anti-collision light (strobe) on unless NVG-equipped. NVG aircraft operating in designated airspace may use lighting options IAW AFI 11-206.

6.5.1.2. If working with an RCO or attack controller, the RCO/attack controller must have an illumination device to make his position readily discernible to NVG-equipped aircraft. NVG aircraft will use external lighting that allows the RCO or attack controller to observe the aircraft in the pattern. If aircraft are employing covert or blacked-out lighting, the RCO/attack controller will be properly equipped and trained with NVGs.

6.5.1.3. In-flight visibility will be at least 5 NM for visual attacks (2 NM for AFSOC rotary wing aircraft).

6.5.1.4. Illuminate the target area with airborne flares or ground marking devices. Night radar bombing, LANTIRN, Pave Tack, F-117, Pave Penny, IR Maverick attacks, NVG, or B-52 STV/FLIR aircraft do not require artificial illumination of the target (see section 6.5.3). However, NVG-equipped aircraft may require artificial illumination if the flight lead deems existing lighting conditions are insufficient.

6.5.1.5. Night Class B/C Dry Clearing Pass. Aircrews must clear the range according to section 6.3.2.1, however, aircrews may perform a combination first run attack, range clearing pass at night under the following conditions:

- Perform a level delivery above 2,000 feet AGL or 1,000 feet AGL for NVG-equipped aircraft (HI).
- Positively identify and clear (visually and/or with sensors) the target area for a minimum of 30 seconds before weapon release.

6.5.1.6. Operate no more than three aircraft (or four LANTIRN aircraft with an operational NAV FLIR or four NVG-equipped aircraft, using either an A/A TACAN or A/A radar) in the same racetrack or conventional pattern. Coordinated SAT attacks of four or more aircraft are only allowed on a single, pre-briefed pass. All racetrack and conventional patterns will provide adequate spacing to allow aircrews to focus primarily on aircraft control vice aircraft deconfliction.

6.5.1.7. The minimum altitude for all night surface attack operations is 1,000 feet AGL or the MSA, whichever is higher, unless operating under a Terrain Following (TF)/Terrain Avoidance (TA) system.

6.5.1.8. Adjust sight settings and switch positions only when wings level and on downwind.

6.5.1.9. Aircrews will make no attempt to air score ownship night deliveries.

6.5.1.10. Continuously monitor flight instruments at night because of depth perception and altitude/attitude perception difficulties.

6.5.2. Night Visual Weapons Delivery Pattern (N/A for helicopters):

6.5.2.1. Maximum planned dive angle is 45 degrees.

6.5.2.2. Minimum altitude on downwind is 1,500 feet AGL or the MSA whichever is higher.

6.5.2.3. Aircrews will begin their recoveries to ensure that their aircraft does not go below the following minimum altitudes:

- 4,500 feet AGL for planned dive angles more than 35 degrees.
- 2,000 feet AGL for planned dive angles between 35 and 20 degrees.
- 1,000 feet AGL for planned dive angles of 20 degrees or less.
- LANTIRN aircraft will refer to MAJCOM MDS-series regulations or pilot TFR minimums, whichever is higher.

6.5.3. Night System Weapons Delivery Pattern:

6.5.3.1. A "Night System" is a device that allows the aircrew to identify the target when normal visual acquisition is not possible.

6.5.3.2. Give Class A range use priority; however, LANTIRN, Pave Tack, F-117 aircraft, NVG aircraft, and B-52 STV/FLIR aircraft may fly events on class B or C ranges.

6.5.3.3. Minimum altitude on downwind is either 1,500 feet AGL, 1,000 feet AGL for FLIR equipped aircraft, TA, or TF limits, whichever is higher. Descend to release altitude when established on final. Bombers may operate at ACCR 51-18 (ACCI 11-BXX Vol 3, when published) altitudes if range operating procedures allow.

6.5.3.4. Minimum spacing between deliveries is 60 seconds. LANTIRN or NVG equipped aircraft may use daylight rules of minimum spacing when operating with an A/A TACAN or an A/A radar.

6.5.3.5. Minimum airspeed during low altitude nose-high weapons delivery (LOFT) or recovery is 300 KIAS (210 KIAS for A/OA-10) or MAJCOM MDS-series minimum, whichever is greater.

6.5.3.6. Maximum angle of bank during LANTIRN recovery maneuvers from a loft or climbing safe escape is 135 degrees, and no lower than MSA until within TF limits. EF-111s will recover according to ACCI 11-F-111.

6.5.4. Night Illumination Flare Procedures:

6.5.4.1. Computations. Mission requirements and effects desired will dictate criteria used. Plan the minimum altitude for flare release to ensure flare burnout before ground impact.

6.5.4.2. Class A Range Radio Procedures. Flare aircraft will use the call sign "Flareship" in all range radio calls regardless of the pattern flown. Use the following radio calls:

- "FLARESHIP, DOWNWIND."
- "FLARESHIP, BASE."
- "FLARESHIP, IN."
- "FLARESHIP, OFF, (Number) FLARES AWAY."
- "Call Sign, IN, FLARESHIP IN SIGHT," is a required call by bomb delivery aircraft when a flareship is flying a different pattern from the bomb delivery pattern. Aircraft will go through dry if the flareship is not in sight.

6.5.4.3. Class B and C Range radio procedures are same as day (see section 6.4.4).

6.5.4.4. Dud Flare Procedures. If suspecting a dud flare, cease range operations until the flare is no longer a hazard.

6.5.4.5. Determining Flare Release Points. Determine the release point by a FAC/TAC/ETAC, radar vector, dead reckoning, or by the RCO. If position is uncertain, do not attempt a flare release.

6.5.4.6. Flare Patterns. Flare patterns and procedures are variable. The flight will approach the target on the weapons delivery heading at the flare pattern altitude and airspeed, or according to local range procedures. Timing during the flight break-up must position the first delivery aircraft on the downwind leg as the flareship releases flares. Make flare drop and ordnance deliveries in any logically prebriefed sequence that provides continuous illumination of the target area.

6.5.4.7. Flare Support Aircraft Coordination. Establish positive coordination between flare support aircraft, weapons delivery aircraft, and RCOs to ensure a mutual understanding and knowledge of the overall operation. Specific briefing items will include:

- Range entry, exit, and deconfliction procedures.
- Pattern altitude and direction.

- Expected number of flares dropped on each pass for each different event.
- Dud flare procedures.

6.6. Live Ordnance Procedures:

- 6.6.1. Do not select live ordnance stations until on the range and ready for delivery. Do not arm delivery systems unless there is an intent to expend and according to range procedures.
- 6.6.2. Following all live ordnance deliveries accomplish a bomb check and battle damage check at the earliest opportunity.
- 6.6.3. Maverick Employment:
- 6.6.3.1. All initial live Maverick firings require a Maverick qualified aircrew, either in the aircraft or in a chase position, to monitor the shot.
- 6.6.3.2. If multiple elements are in the formation, non-firing elements will maintain a position clear of the firing element and stacked high.
- 6.6.3.3. If the missile launch has not occurred before reaching minimum range, abort the firing pass.

6.7. Operations With Naval Ships. The following additional rules apply during maritime training when not covered by published joint exercise SPINS.

- 6.7.1. The following restrictions govern flight in the proximity of non-participating ships:
- Do not directly overfly.
 - Do not fly across a bow.
 - Do not penetrate a 1 NM bubble vertically or horizontally.
 - Do not fly more than two aircraft in the immediate vicinity.
 - Do not perform any provocative or aggressive acts, or any acts reasonably perceived as provocative or aggressive.
 - Do not expend ordnance within 10 NM.
 - Limit uses of a nonparticipating surface ship to navigation practice setups only, however, do not use nonparticipating surface ships with ordnance on board.
- 6.7.2. Rules during training with participating ships must be according to prebriefed naval SPINs for the ships concerned. In no case will aircraft penetrate a 500 foot bubble around exercise ships.
- 6.7.3. During multiple sector attacks, maintain a 1,000 foot minimum altitude differential between converging single aircraft. Maintain a 2,000 foot differential between converging elements.
- 6.7.4. A maximum of two aircraft will engage in near simultaneous attacks (10 seconds minimum spacing) on the same target. The second aircraft must maintain visual contact.
- 6.7.5. A maximum of four aircraft can attack a single target with a minimum of 20 seconds between elements.
- 6.7.6. A maximum number of eight aircraft can attack a simulated Surface Attack Group (SAG) of two or more targets simultaneously.
- 6.7.7. The minimum distance between simulated SAG targets is 1 NM for simultaneous attacks.
- 6.7.8. Aircrews will not attack targets outside their prebriefed attack quadrant.
- 6.7.9. Aircrews will not attack into reflected sunlight.
- 6.7.10. An in-flight heading check is mandatory upon initiating recovery from maritime training.
- 6.7.11. Do not expend ordnance if cloud decks or in-flight visibility do not allow absolute clearance of the weapons release area within 10 NM.

6.8. Joint Live Fire Guidance:

- 6.8.1. General.
- 6.8.1.1. During joint live fire operations (i.e. activity involving members of another service in which objects or projectiles are dropped, fired, or expended from an aircraft), careful planning and execution is required by all participants.
- 6.8.1.2. All members will be fully briefed on ordnance discipline IAW applicable directives.
- 6.8.1.3. The ALO/FAC/ETAC controlling the impact area and supporting fires will ensure positive communications are maintained between all parties. If two-way communication between any party is lost, all ordnance delivery activities will cease until communications are re-established.
- 6.8.1.4. All fires during the airstrike will be coordinated in detail by the FAC/ALO/ETAC with the appropriate maneuver and fire support unit prior to commencement of the air strike.
- 6.8.1.5. A safety observer with two-way radio communications will be required if terrain, weather, or other factors restrict the FAC/ALO/ETACs ability to observe and control the live fire operation. The safety observer is a FAC/ALO/ETAC in a

position to observe the target and attacking aircraft, with full abort authority and responsibility to ensure the correct target is attacked. The use of a safety observer is a peace-time requirement intended to enhance safe operations, not to restrict properly-executed CAS/JAAT operational procedures.

6.8.1.6. In the absence of established local range restrictions, the ordnance risk-estimate distance criteria given in JMEM Risk Estimates for Friendly Troops (USAF TH61A1-3-9) will be used to plan and execute Joint Operations. Planners should bear in mind that these are minimum distances which allow for a small percentage of casualties. Since no casualties are acceptable during peacetime training, greater distances must be used to ensure personnel safety. Consider all relevant factors, including munition type, terrain, and operational complexity.

6.8.1.7. Refer to Attachment 8, "Aircrew And Terminal Attack Controller Coordination Guide."

6.8.2. Air Strike Control Procedures:

6.8.2.1. Whenever possible, airstrikes during CAS/JAAT operations should be controlled by a FAC/ALO/ETAC exercising direct control (as defined in MCM 3-1 Vol 3 and JP 3-09.3). Indirect control over the attack aircraft may be used IAW para 6.8.1.5 when direct control is impractical.

6.8.2.2. Troop and target identification is critical. If possible, the target will be marked by a unique terrain feature or marking device (e.g. artillery round, laser, IR pointer, etc.). Exacting measures will be taken to avoid mistaken target identity and to ensure all participants are thoroughly oriented to the specific safety parameters.

6.8.2.3. The attack aircraft will perform an initial dry pass using the attack parameters, followed by target area and friendly position orientation. After all flight members confirm target area and friendly location(s), the next attack may be performed "hot." Rehearsals conducted up to 48 hours in advance may count as the initial pass, provided all major participants (aircrew and FAC/ALO/ETAC) and parameters remain the same.

6.8.2.4. Although the intent of live fire exercises is to enhance realism, safety will not be compromised.

JOHN P. JUMPER, Lt General, USAF
DCS/Air & Space Operations

GLOSSARY OF REFERENCES, ABBREVIATIONS, ACRONYMS AND TERMS***References***

AFI 10-701, *Performing Electronic Countermeasures in the U.S. and Canada.*
AFI 11-206, *General Flight Rules*
AFI 13-212, *Training Weapons Ranges*
AFJI 36-2220, *Joint USAF/USA/USN/USMC Air Combat Training*
AFM 1-1, *Basic Aerospace Doctrine of the USAF*
AFSOCI 11-202, *C-130 Operations.*
AFSOCMAN 11-1, *Tactical Employment (Special Operations)*
AFSOCCR 55-18 (or joint equivalent), *Helicopter Operations.*
AFSPCI 11-201, *Helicopter Operations.*
MCI 11-MDS Volume 1, *Aircrew Training*
MCI 11-MDS Volume 3, *Combat Aircraft Operational Procedures*
MCM 3-1, *Mission Employment Tactics*
MCM 3-3, *Combat Aircraft Fundamentals*
TO 1-1M-34, *Aircrew Weapons Delivery Manual*
TO 1-1M-34-1, *Aircrew Weapons Delivery Manual* (classified)

Abbreviations and Acronyms

A/A—Air to Air
ABCCC—Airborne Battlefield Command and Control Center
ACC—Air Combat Command
ACBT—Air Combat Training
ACM—Air Combat Maneuvers
ACMI—Air Combat Maneuvering Instrumentation
ACO—Airspace Coordination Order
ACT—Air Combat Tactics
AETC—Air Education and Training Command
AFSOC—Air Force Special Operations Command
AGL—Above Ground Level
AGM—Air-to-Ground Missile
AGTS—Aerial Gunnery Target System
AI—Air Interdiction or Air Intercept
ALO—Air Liaison Officer
AMC—Airborne Mission Commander or Air Mobility Command
ANG—Air National Guard
AOB—Air Order of Battle
AOC—Air Operations Center
AOR—Area of Responsibility
ARM—Anti-radiation Missile
ATC—Air Traffic Control
ATO—Air Tasking Order (FRAG)
AWACS—Airborne Warning and Control System
BFM—Basic Fighter Maneuvers
BRAA—Bearing, Range, Altitude and Aspect of target
BVR—Beyond Visual Range
C—Designator for cargo type aircraft (C-5, C-17, C-130, C-141)
CAP—Combat Air Patrol
CAS—Close Air Support
CAF—Combat Air Forces
CCA—Command and Control Agency
C3—Command, Control, and Communications
CFT—Composite Force Training
COMSEC—Communications Security

CSAR—Combat Search and Rescue
CT—Continuation Training
DART—Deployable Aerial Reflective Target
DCA—Defensive Counterair
DF—Direction Finding
EA—Electronic Attack
EEI—Essential Elements of Information
ECCM—Electronic Counter-Countermeasures
ECM—Electronic Countermeasures
EMCON—Emission Control
EP—Electronic Protection
EOB—Electronic Order of Battle
ETAC—Enlisted Terminal Attack Controller
EW—Electronic Warfare
F—Any “F or A” designated aircraft (i.e. F-15E, F-16, EF-111, A-10, etc.)
FAC—Forward Air Controller
FEBA—Forward Edge of the Battle Area
FLIR—Forward Looking Infra-red
FLOT—Forward Line of Own Troops
FTS—Fighter Training Squadron
FTU—Formal Training Unit
G—Gravity
GCI—Ground Controlled Intercept
HI—High Illumination
HUD—Head-Up Display
IFF—Identification, Friend or Foe
IMC—Instrument Meteorological Conditions
IP—Initial Point or Instructor Pilot
IR—Infrared
JAAT—Joint Air Attack Team
KIAS—Knots Indicated Airspeed
KIO—Knock-It-Off
km—kilometer
LAHD—Low Angle High Drag
LANTIRN—Low-Altitude Navigation Targeting Infrared for Night
LATN—Low Altitude Tactical Navigation
LI—Low Illumination
LOS—Line-of-Sight
MC—Mission Capable
MDS—Model Designation Series
MOA—Military Operating Area
MQT—Mission Qualification Training
MR—Mission Ready
MSA—Minimum Safe Altitude
MSL—Mean Sea Level
NAF—Numbered Air Force
NM—Nautical Mile
NORAD—North American Aerospace Defense Command
OPSEC—Operations Security
OSC—On Scene Commander
OT&E—Operational Test and Evaluation
POM—Plane of Motion
PTC—Positive Target Control
RCO—Range Control Officer
RAOC—Region Air Operations Center
ROE—Rules of Engagement

RTO—Range Training Officer (ACMI)
RWR—Radar Warning Receiver
SA—Surface Attack or Situational Awareness
SAG—Surface Attack Group
SAM—Surface-to-Air Missile
SAOC—Sector Air Operations Center
SAR—Search and Rescue
SAT—Surface Attack Tactics
SEAD—Suppression of Enemy Air Defenses
SIF—Selective Identification Feature
SMS—Stores Management System
SOF—Supervisor of Flying
SPINS—Special Instructions
STV—Steerable Television
TA—Training Area or Terrain Avoidance
TAC—Terminal Attack Controller
TACS—Theater Air Control System
TF—Terrain Following
TFR—Terrain Following Radar
TO—Technical Order
TOD—Time of Day
TOT—Time on Target
TR—Training Rule
USAFE—United States Air Force Europe
USAFR—US Air Force Reserve
USAFWS—USAF Weapons School
VECP SD—Value Engineering Change Proposal Smokey Devil
VID—Visual Identification
VMC—Visual Meteorological Conditions
WD—Weapons Director
WSEP—Weapons System Evaluation Program

Terms

Adversary—An aircrew or aircraft flying as an opponent during air-to-air training.

Advisory Control—A radio monitor mode used when the controlling agency loses radar, shuts down radar to avoid attack, loses effective use of radar due to countermeasures, or the fighters are outside radar coverage.

Airborne Order—A command and authorization for flight with a predetermined time of greater than five minutes for aircraft to become airborne.

Air Combat Maneuvers—Training designed to achieve proficiency in element formation maneuvering and the coordinated application of BFM to achieve a simulated kill or effectively defend against one or more aircraft from a preplanned starting position.

Air Combat Tactics—Training in the application of BFM and ACM skills to achieve a tactical air-to-air objective.

Air Combat Training—A general term that includes (D)BFM, (D)ACM, and (D)ACT.

Air Refueling Track—A flight path designated for air refueling.

Aspect Angle—The angle between the longitudinal axis of the target (projected rearward) and the line of sight to the interceptor measured from the tail of the target.

Attacker—Air-to-air: An aircraft simulating carrying air-to-air ordnance engaged in offensive maneuvering Air-to-surface: An aircraft in the process of delivering air-to-surface ordnance.

Attack Restriction—Ingress, ordnance delivery, or egress restrictions depending on situation, (such as, threats, weather, terrain, rules of engagement, etc.)

Autonomous—Aircrew is operating without benefit of information or guidance from a controlling agency.

Bandit—A positive identification of enemy aircraft. The term is a function of identification and does not necessarily imply direction or authority to engage.

Baron—A specifically selected and trained aircrew performing the role of visual or electronic training aid.

Basic Fighter Maneuvers—Training designed to apply aircraft handling skills to gain proficiency in recognizing and solving range, closure, aspect, angle off, and turning room problems in relation to another aircraft to either attain a position to employ weapons, deny the adversary a position to employ weapons, or defeat weapons employed by an adversary.

Bingo Fuel—A prebriefed fuel state that allows the aircraft to return to the base of intended landing or alternate, if required, using preplanned recovery parameters and arriving with normal recovery fuel.

Bogey—An unidentified air contact.

Bogey Dope —A request for target information.

Bomber —Any “B” designated aircraft (i.e., B-1, B-2, or B-52).

Broadcast Control—A mode of control that passes target information by referencing a designated location, series of locations, or a grid system.

Buffer Zone—Airspace of defined dimensions adjacent to or near borders between friendly and belligerent countries.

Cell—Two or more tankers or bombers flying in formation.

Class A Range —A manned range as defined in AFI 13-212, *Training Weapons Ranges*, where a range control officer is present with two-way radio voice communication capability.

Class B Range —A manned or unmanned range with scoring capability, but no range control officer.

Class C Range—An unmanned range with no scoring or control capability.

Clock Code—The position of a target in relation to an aircraft or ship with dead-ahead position considered 12 o'clock.

Close Control—A mode of control varying from providing vectors to providing complete assistance including altitude and heading.

Closure—Relative velocity of one aircraft in relation to another.

Collision Course—A flight path that directs an aircraft toward a point at which it will collide with another aircraft.

Combat Air Patrol —An aircraft patrol provided over an objective area, over the force protected, over the critical area of a combat zone, or over an air defense area, for the purpose of intercepting and destroying hostile aircraft before they reach their target.

Comm Jam/Jamming—Attempt to interrupt communication.

Commit—The decision to initiate an intercept or engagement against a target or enemy force.

Composite Force—Multiple flights of the same or different MDS aircraft, each under the direction of its own flight leader, performing the same or different roles.

Corner (Velocity)—The minimum airspeed that can generate the maximum allowable aircraft G.

Defender—Any type of aircraft attempting to defeat or deny an adversary's weapons employment.

Defensive Maneuvering—Maneuvers designed to negate the attack or ordnance of a maneuvering adversary, surface or airborne.

Electronic Attack—That division of electronic warfare involving the use of electromagnetic or directed energy to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability. Also includes: 1) actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception, and 2) employment of weapons that use either electromagnetic or directed energy as their primary destructive mechanism (lasers, radio frequency weapons, particle beams).

Electronic Warfare —Any military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or to attack the enemy.

Element—A flight of two aircraft.

Element Pop-up—A two ship pop-up attack where the wingman's only reference is the flight lead.

Engaged/Engagement—Maneuvers by one or more opposing aircraft attempting to achieve or prevent weapons firing positions.

Faker—A friendly aircraft simulating a hostile in an air defense exercise.

Flush—A precautionary launch of aircraft for survival.

Frag—Air tasking order.

Friendly—A positively identified friendly contact.

Ground ECM Environment Exercise —An exercise in which fighter activity combines with countering ground based EW/GCI, acquisition, or communications.

High Illumination—A minimum of 2.2 millilux illumination derived from natural or artificial sources (unless defined otherwise in aircraft specific MAJCOM MDS series instructions). The flight lead or individual pilot is the final determining authority to assess actual illumination for a particular mission element, based on visibility and terrain features/resolution.

Hostile—A contact positively identified as enemy in accordance with theater rules of engagement.

Hung Ordnance—Any item attached to the aircraft for the purpose of dropping or firing which has malfunctioned or failed to release. In addition, hung ordnance includes the following items: (1) Live unexpended ordnance, excluding 20/30 mm ammunition and air-to-air missiles; (2) External fuel tanks after unsuccessful jettison attempt; (3) Remaining ordnance after an inadvertent release; (4) 20/30 mm ammunition after a gun malfunction (no fire, unplanned cease fire, runaway gun, or gun unsafe indication); (5) Any stores determined to be in an unsafe condition.

Initial Trainer Aircraft —AETC aircraft used for initial flight training (T-37, T-1A, T-38, and T-43).

Intercept—The phase of an air-to-air mission between the commit and the engagement when the fighter executes a series of maneuvers using ground controlled intercept, Airborne Warning and Control System, on board systems, or dead reckoning, to place the aircraft or flight in a position to employ air-to-air ordnance, make a visual identification, or initiate a visual engagement.

Inadvertent Release—Uncommanded fired or dropped ordnance. If commanding a single release, do not consider a double bomb release as an inadvertent release if the releases occur from a practice bomb dispenser.

Inert Ordnance—Ordnance with the explosive or incendiary material removed (Includes BDU-50).

Jettison—The selective release of stores from an aircraft for other than a normal attack.

Judy —The aircrew has a radar or visual contact on the correct target, has taken control of the intercept, and only requires situational awareness information; WDs will minimize radio transmission. Can be specified for only a portion of the information (Judy angles) or a portion of the scenario (Judy there).

Live Ordnance—Combat type ordnance incorporating explosive or incendiary material including night illumination flares. Do not consider self-protection flares and spotting charges as live ordnance.

Low Altitude—Below 5,000 feet AGL or as defined by MAJCOM.

Low Altitude Air Refueling (LAAR)—Air-refueling conducted below 12,000 feet MSL or 10,000 feet AGL, whichever is higher (*Exception:* Below 5,000 feet AGL constitutes C-130 low altitude refueling). AR operations based at or above 12,000 feet MSL that momentarily fall below 10,000 feet AGL, but not less than 5,000 feet AGL, due to overflight of mountain ridges, peaks, etc., are not considered LAAR.

Low Altitude Tactical Navigation—Low altitude training using the fundamental aspects of dead reckoning and point-to-point low altitude navigation, with or without prior route planning.

Low-Altitude Training—Mission oriented operations in the low block altitude.

Low Illumination—Less than 2.2. millilux (unless defined otherwise in aircraft specific MAJCOM MDS-series instructions). The flight lead or individual pilot is the final determining authority to assess actual illumination for a particular mission element, based on visibility and terrain features/resolution.

Mixed Force—The employment of a single flight of different MDS aircraft, performing the same tactical role, under the direction of a single flight leader.

Mutual Support—That support which units render each other against an enemy, because of their assigned tasks, their position relative to each other and to the enemy, and their inherent capabilities.

Offensive Maneuvering —Maneuvers against an opponent to achieve weapons parameters.

Picture—A brief air-to-air situation update.

Playtime—Time available before an aircraft has to depart.

Potential Threat—A bogey or bandit observed between 10 and 30 NM of friendly aircraft.

Practice Ordnance—Ordnance specifically designed or modified for practice. BDU-33, BDU-38, BDU-48, MK-106, TGLM, ATM, CATM, PTM, and classify ball (or tracer - TPT) gun ammunition as practice ordnance.

Primary Force—The flights that are being protected or escorted.

Release—In air armament, the intentional separation of a free-fall aircraft store, from its suspension equipment, for purposes of employment of the store.

Scramble Order—An order directing takeoff of aircraft as quickly as possible, usually followed by mission instructions.

Skip It—In air intercepts, a code meaning, “Do not attack”; “Cease attack”; “Cease interception.”

Tactical Control—A mode of control similar to close control with regard to information provided, except the WD does not provide vectors to the aircrew.

Tactical Formation—Formations, as defined by MCM 3-1 and MCM 3-3, that provide mutual support.

Tanker—Any “KC” designated aircraft (i.e., KC-10, or KC-135).

Target—Object being attacked.

Unexpended Ordnance—Ordnance that is still onboard because no release was attempted.

Unintentional Release—Ordnance fired or dropped through pilot error.

AIR-TO-AIR TRAINING COORDINATION AND BRIEFING GUIDE

(To be used for face-to-face, telephonic briefings, or for message formats)

A2.1. Date/Time:**A2.2. Participants:**

- Units
- Aircraft Types
- Call Signs

A2.3 Mission Commander or Deputy Mission Commander:**A2.4. Working Area or Airspace Limits:**

- Times
- Horizontal Boundaries
- Vertical Limits
- Minimum Altitudes
- EA (Electronic Attack), EP (Electronic Protection), and Flare Restrictions and Clearances
- Controlling Agencies
- Emergency Bases
- Weather

A2.5. Scenario SPINS:

- Scenario, Mission, and Learning Objectives
- Situation, State, and Stage of Alert
- Type aircraft simulated
- Ordnance simulated (number and type)
- Roles and Tactical Objectives
- Performance and Avionics constraints
- Tactics constraints
- Maneuvering Limits (Maneuvering Categories, Aircraft Maneuvering Limits)
- Points, Defended Areas, and Homes
- ROE (Hostile acts, BVR requirements, employment constraints)
- Valid shot parameters
- Kill criteria
- Shot and Kill passing
- Kill removal
- Level of GCI or AWACS control
- Frequencies and Have Quick Nets
- Squawks
- Blocks
- Surface threats
- Simulated geographic points (FEBA, threats)

A2.6. Rendezvous Procedures (location, altitude, time, method):**A2.7. Training Rules (if nonstandard):****A2.8. Knock-it-off Criteria:****A2.9. Alternate Missions:**

- Fewer than planned aircraft
- Single frequency
- Single GCI or AWACS scope
- No GCI or AWACS

- Weather

A2.10. Recovery and Escort Procedures:

A2.11. Emergency Procedures:

A2.12. Debriefing (Time and Place):

AIRCREW AND WD COORDINATION GUIDE

(Use for Face-to-Face, Telephonic, or In-Flight Coordination)

Section A—BRIEFING**A3.1. Participants:**

- Units
- Aircraft Types
- Call Signs

A3.2. Working Area:

- Times
- Horizontal Boundaries
- Entry, Exit Points, and Routing
- Rendezvous Procedures (location, altitude, time, method)

A3.3. Scenario SPINS:

- Scenario, Mission, and Learning Objectives
- Situation, State, and Stage of Alert
- Type aircraft simulated
- Type ordnance simulated
- Roles and Tactical objectives
- Points, Defended areas, and Homes
- ROE (Hostile acts, BVR requirements, employment constraints)
- Shot and Kill passing method
- Level of GCI
- Frequencies and Have Quick Nets
- Squawks
- Blocks
- Surface Threats
- Simulated Geographic Points (FEBA, threats)

A3.4. Tactics:

- Expected adversary tactics
- Friendly tactics

A3.5. Training Rules:**A3.6. Knock-it-off Criteria:****A3.7. Alternate Missions:**

- Fewer than planned aircraft
- Single frequency
- Single GCI scope
- No GCI
- Weather

A3.8. Special Training Requirements:**A3.9. Rendezvous and Recovery:****A3.10. Emergencies:**

- Assistance required
- Lost Comm procedures

Section B—DEBRIEFING

A3.11. Accomplishment of Mission Objectives:

A3.12. Tactics Used:

A3.13. Lessons Learned:

AWACS COORDINATION FORMAT

Items A4.1 through A4.7 require verbal description for fighters and adversaries. Items A4.8 and A4.9 may simply reference subparagraphs (such as, A4.8.2.5).

A4.1. Mission role.**A4.2. FEBA and CAP Points.****A4.3. ID Requirements.****A4.4. Commit Criteria.****A4.5. Altitude Blocks.****A4.6. IFF Squawks.****A4.7. Frequency or Have Quick Net.****A4.8. Type of Control.**

A4.8.1. Close control.

- Cutoff
- Stern
- VID

A4.8.2. Tactical control.

- Maximize information and communication
- Minimize communication
- Be directive with fighter
- Fighter executes on own
- Emphasize formations and tactics

A4.8.3. Broadcast Control.

- Point
- Grid
- Geographic

A4.9. Type Tactics.

A4.9.1. High Speed Ingress and Minimum Turning.

A4.9.2. Bracket.

A4.9.3. Single side offset.

A4.9.4. Low Altitude Ingress.

A4.9.5. High Altitude Ingress.

A4.9.6. Front Attack.

A4.9.7. Stern Conversion.

A4.9.8. BFM.

A4.9.9. Other.

A4.10. Shot Passing.**A4.11. Debrief.**

A4.11.1. Time.

A4.11.2. Place.

A4.11.3. Telephone Number.

A4.11.4. Name.

A4.12. Remarks.

BOMBER EXERCISE COORDINATION GUIDE

A5.1. This coordination guide applies during Ground ECM Environment Exercise and fighter air-to-air training with bomber aircraft.

A5.2. The bomber aircrew will contact the RAOC/SAOC and provide the following:

- Aircraft call sign.
- Ground ECM Environment Exercise scheduled.
- Initial Point (IP),
- IP time.
- Scheduled training area (TA).
- Present position and altitude.
- IFF and SIF mode.
- Crew number,
- Armament safety check completed.
- Request for chaff, flare, explosive chaff, or electronic jamming clearance.
- Desired ECM start time after IP and frequency.
- Confirmation of bomber defensive maneuvers and the briefing of all participants.
- Request WD number.

A5.3. The RAOC/SAOC will record this information provided by the aircrew and provide the bomber crew with the following:

- Positive Target Control (PTC) - IFF and SIF setting.
- Confirm radio and SIF contact.
- If authorized defensive maneuvering.
- WD number.
- ECM, chaff, flares, or explosive chaff clearance and operating bands.
- Altitudes available for training.

VID PROCEDURES

A6.1. This attachment prescribes end-game procedures used for aircraft executing a visual identification (VID) maneuver. Although the air-to-air training ROE of Chapter 5 does not apply to the procedures of this attachment, the intercept portion of this procedure may (similar to a tanker rendezvous before air-to-air refueling). Aircrew will apply the separation and airspeed minimums in this attachment after the intercept is complete and closure is under control. Use the following procedures in the absence of other MAJCOM directives or requirements.

A6.2. Aircrews will maintain a minimum of 1,000 feet vertical separation throughout the pass when directed to conduct a beam or front VID pass. Aircrews will use altitude readouts from on-board radar as the primary method for ensuring altitude separation. Use other means of determining target altitude such as verbal confirmation of altitude by the target aircraft or Mode 3/C IFF altitude readouts as backups to confirm target altitude and ensure minimum separation. If unable to positively determine vertical separation by 10 NM, convert the intercept to stern geometry.

A6.3. Fighters performing a stern aspect intercept and rendezvous to VID range adhere to the following:

A6.3.1. Maintain a minimum of 1,000 feet vertical separation between the fighter and target aircraft until establishing positive radar or visual contact in the stern aspect of the target.

A6.3.2. Proceed no closer than 3 NM without a visual on the target unless establishing positive radar contact providing target range, azimuth, and elevation.

A6.3.3. Proceed no closer than 1 NM without positive radar lock-on providing target range, azimuth, elevation, and closure rate. (Exception: the fighter may proceed inside 1 NM during daylight conditions with a visual contact on the target.)

A6.3.4. At night, instrument meteorological conditions, or during the day without visual contact with the target, do not proceed inside 1 NM range unless attaining an approximate co-speed (a maximum of 50 knots closure) condition.

A6.3.5. Fighters will use the following to determine minimum airspeeds:

- F-15: 20 Units AOA
- F-16 CAT I: 13 Units AOA
- F-16 CAT III: 200 KIAS

A6.3.6. Proceed no closer than the following minimum slant range without a visual contact:

- F-15/F-16: 1500 Feet
- F-16ADF (VID Mode): 700 Feet or break "X," whichever occurs first.

A6.3.7. Even with a visual contact, proceed no closer than 500 foot slant range to the target. The fighter may move inside 500 feet slant range to the target if flight safety is not jeopardized and it is necessary to accomplish the mission (e.g.; aiding an aircraft in distress or intelligence collection). In this case, the mission will dictate the maximum closure and minimum slant ranges required.

A6.3.8. Never intercept a target at co-altitude inside 3 NM range except as required by A6.3.7 above.

A6.3.9. Execute an immediate breakaway from the target anytime one of the following occurs:

- Losing radar contact on the target with no visual contact and inside 3 NM.
- Losing radar lock-on to the target (unless in daylight conditions and visual contact is maintained) and inside 1 NM.
- Losing visual contact on the target and inside minimum slant range as listed in A6.3.5 above.

AIR-TO-AIR LIVE FIRE PROCEDURES

A7.1. Aerial Gunnery. The following rules apply to missions involving live gun firings against towed targets.

A7.1.1. General.

A7.1.1.1. The TRs in this instruction apply with the following additional restrictions:

- Implement procedures to ensure the range is clear of surface activity and other aircraft before firing over an undercast.
- Cease fire if sighting any surface activity or other aircraft in the bullet impact area.
- A Range Control Officer (RCO) must be present during firing.

A7.1.1.2. Responsibilities:

A7.1.1.2.1. Flight Leader. After join-up with the tow aircraft, the engaging flight leader will become the RCO with the following responsibilities:

- Conduct all firing within the boundaries of the applicable area or range.
- Ensure the range is clear of surface and other airborne traffic at all times during firing.
- Ensure compliance with all TRs.
- Assess fouls.

A7.1.1.2.2. Tow Pilot.

A7.1.1.2.2.1. The tow pilot shares responsibility for safety during the mission to include:

- Ensures firing occurs within the range boundaries.
- Ensures the range is clear of traffic.
- Ensures TR compliance.

A7.1.1.2.2.2. Procedurally the tow pilot will:

- Receive the flight briefing.
- Fly the prebriefed pattern.
- Initiate radio calls to control the firing sequence.
- Assess fouls.

A7.1.1.3. Tow Procedures:

A7.1.1.3.1. The tow pilot will precede the aerial towed target launch with a warning call if being chased.

A7.1.1.3.2. The tow pilot will establish a turn before issuing a "CLEARED TO FIRE" call.

A7.1.1.4. Shooter Procedures:

A7.1.1.4.1. If the shooters monitor the launch, they should watch for any malfunctions and immediately inform the tow pilot if any malfunctions occur.

A7.1.1.4.2. Shooters will remain clear of a point directly below or astern the tow aircraft at all times.

A7.1.1.4.3. Shooters will acknowledge all calls from the tow pilot.

A7.1.1.4.4. Maintain safe separation from the target if the shooter air scores the target.

A7.1.1.4.5. Do not make firing passes on a target that rolls in a turn, is flying high on the tow, or flying in an erratic manner.

A7.1.1.4.6. While engaged, the shooter will maintain positive overtake and a minimum of 5 degrees angle-off to the inside of the target's turn.

A7.1.1.4.7. The shooter and chase must prepare to avoid target debris that will result from a hit. Immediately after firing, shooters will perform an escape maneuver to get out of the target's plane of motion (POM) and avoid a 5 degree cone aft of the target's POM.

A7.1.1.4.8. If the shooter requires a chase aircraft, the chase will maneuver as necessary to observe the firing distance, effectiveness, and shooter position relative to the gun line of fire. The chase will fly a position to avoid target debris and the shooter during the escape maneuver.

A7.1.1.5. Fouls. Assess a foul to the aircrew for any of the following conditions:

- Firing without a clearance.
- Firing from outside the turn of the target.
- Firing within 1,000 feet of the target.
- Flying within 800 feet of the target.

A7.1.2. Basic Patterns. The following section defines various patterns available for DART training. The pattern selected and the tactics employed should meet the training requirements for the individual unit.

A7.1.2.1. A racetrack pattern (figure A7.1) consists of a climbing 180 degree turn, approximately 30 seconds of wings level time to allow the attacker to regain a suitable perch or to change shooters, followed by a diving 180 degree turn and another approximate 30 seconds of wings level time.

A7.1.2.2. A modification of the race track and figure-8 patterns is the figure-S pattern (figure A7.2).

A7.1.2.3. A figure-8 pattern (figure A7.3) consists of a climbing turn of approximately 270 degrees followed by 30 seconds of wings level time for repositioning or shooter changes; then a diving 270 degree turn and another approximate 30 seconds of wings level time.

A7.1.2.4. F-86 tow aircraft will primarily use a spiral pattern. The tow aircraft will normally begin at 20,000 to 25,000 feet MSL, and will maintain 300 to 350 KIAS and 2-4 G during consecutive 360 degree descending turns. Aircrew may use the pattern for basic qualification or Combat DART employment.

A7.1.2.5. Butterfly Procedures.

A7.1.2.5.1. The initial attack position is route formation with the tow aircraft. When the tow pilot calls "SPLIT," attacking and tow aircraft will turn 45 degrees away from each other using 60 degrees of bank (figure A7.4).

A7.1.2.5.2. When either pilot calls "REVERSE," both aircraft will start a 135 degree turn toward each other using 60 degrees of bank. The attacking pilot is responsible for keeping the tow ship and target in sight.

A7.1.2.5.3. After starting the second maneuver, the attacker maneuvers to pass the tow aircraft head on and in wings level flight. In addition, the attacker must be 3,000 feet above and 3,000 feet to either side of the tow.

A7.1.2.5.4. The pattern and timing begin when the attack and tow aircraft pass abeam and the tow pilot calls "CLEARED TO FIRE."

A7.1.2.5.5. The tow aircraft will turn up and into the attacker at the "CLEARED TO FIRE" call (figure A7.5). The tow pilot will start a climbing 180 degree turn using 55 to 60 degrees of bank and 2-4 G. Approaching the 180 degree point, the tow will increase bank to 90 degrees, maintain G, and start a descending 180 degree turn. As airspeed increases, the tow will decrease the bank angle to 60 degrees and maintain the same G schedule. Approaching 360 degrees of turn, the tow will call "CEASE FIRE," reverse the turn, and then call "CLEARED TO FIRE." Accomplish the same maneuver in the opposite direction in the second 360 degree turn. At the completion of the second turn, the pattern is complete. Aircrew may fly a shorter pattern depending on fuel state.

A7.1.2.5.6. The attacker is free to maneuver as desired to obtain a hit in the shortest possible time. Determine scoring on the attacker's call "HIT, REPEAT HIT." The wingman and tow pilot will monitor and record the elapsed time. Also determine elapsed time from VTR recordings.

A7.1.2.5.7. Do not fire from a head-on pass.

A7.1.2.6. On combat DART missions shooters should employ as a two-ship element if two aircraft are available.

A7.1.2.6.1. Figure A7.6 depicts the Combat DART Pattern. The tow will maintain 300 to 450 KIAS. The shooters will perform a two-ship front quarter tactical intercept using MCM 3-1 tactics. The altitude separation requirements in section 5.2.9 apply. Clearance for the tow ship to maneuver occurs when; (1) the tow ship has visual contact with one shooter and the shooters pass line abreast, (2) the attacking flight leader directs the tow ship to maneuver, or (3) as briefed by the attacking flight leader. The tow ship will issue the call "CLEARED TO FIRE" after establishing the turn. Shooter tactics should include simulated missile employment culminating in a gun attack on the target. Continue attacks, using proper radio terminology and attack procedures, until finishing the engagement, time expires, reaching bingo fuel, Winchester, or approaching minimums. At this time, call a KIO and all members of the flight will acknowledge the call, after this the tow may roll out of the turn.

A7.1.2.6.2. Pattern Modification. Adjust attacker and tow set-ups to provide other logical patterns or scenarios. Aircrew may initiate attacks from a visual set-up if weather, range time, or other constraints prevent a BVR intercept.

A7.1.2.6.3. Each shooter will ensure that the other attacker is clear of the target before shooting. Normally, the old attacker should reposition high after firing to avoid conflict with the target and the new shooter's attack.

Figure A7.1. Typical Racetrack Dart Pattern.

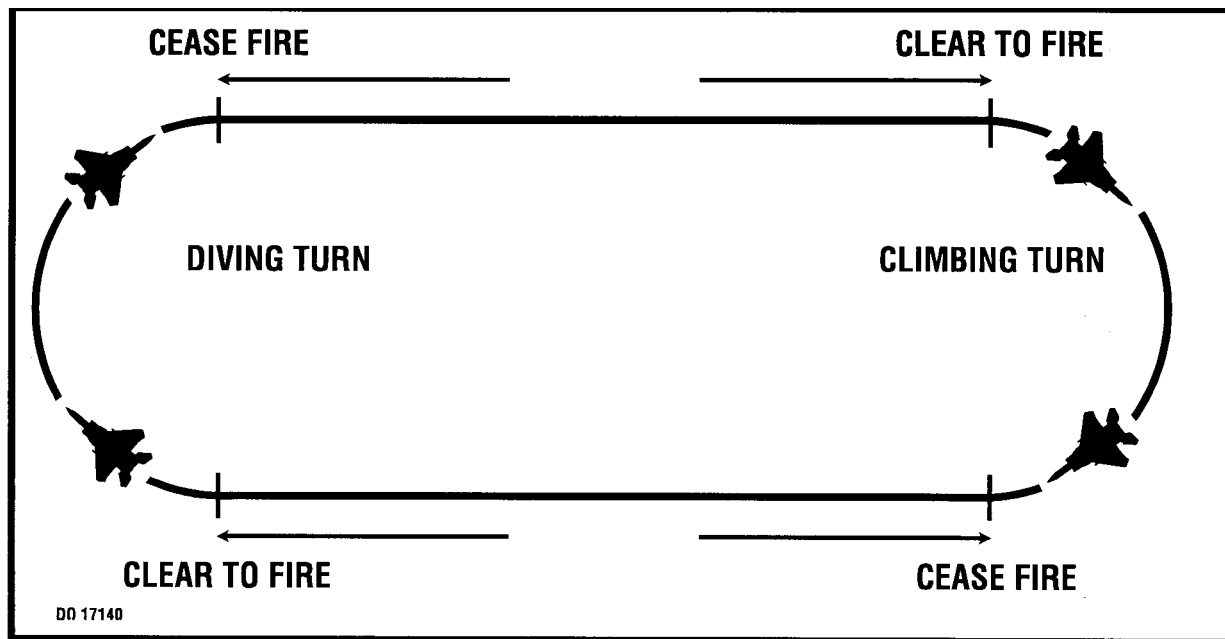


Figure A7.2. Typical Figure "S" Dart Pattern.

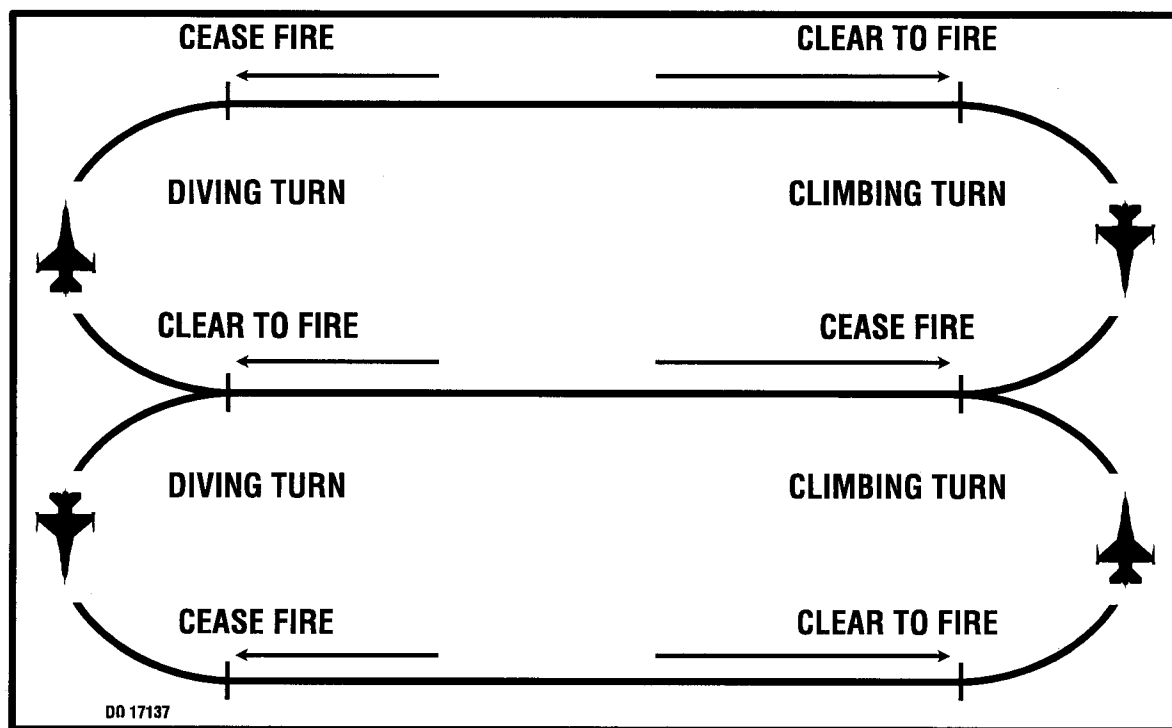


Figure A7.3. Typical Figure "8" Dart Pattern.

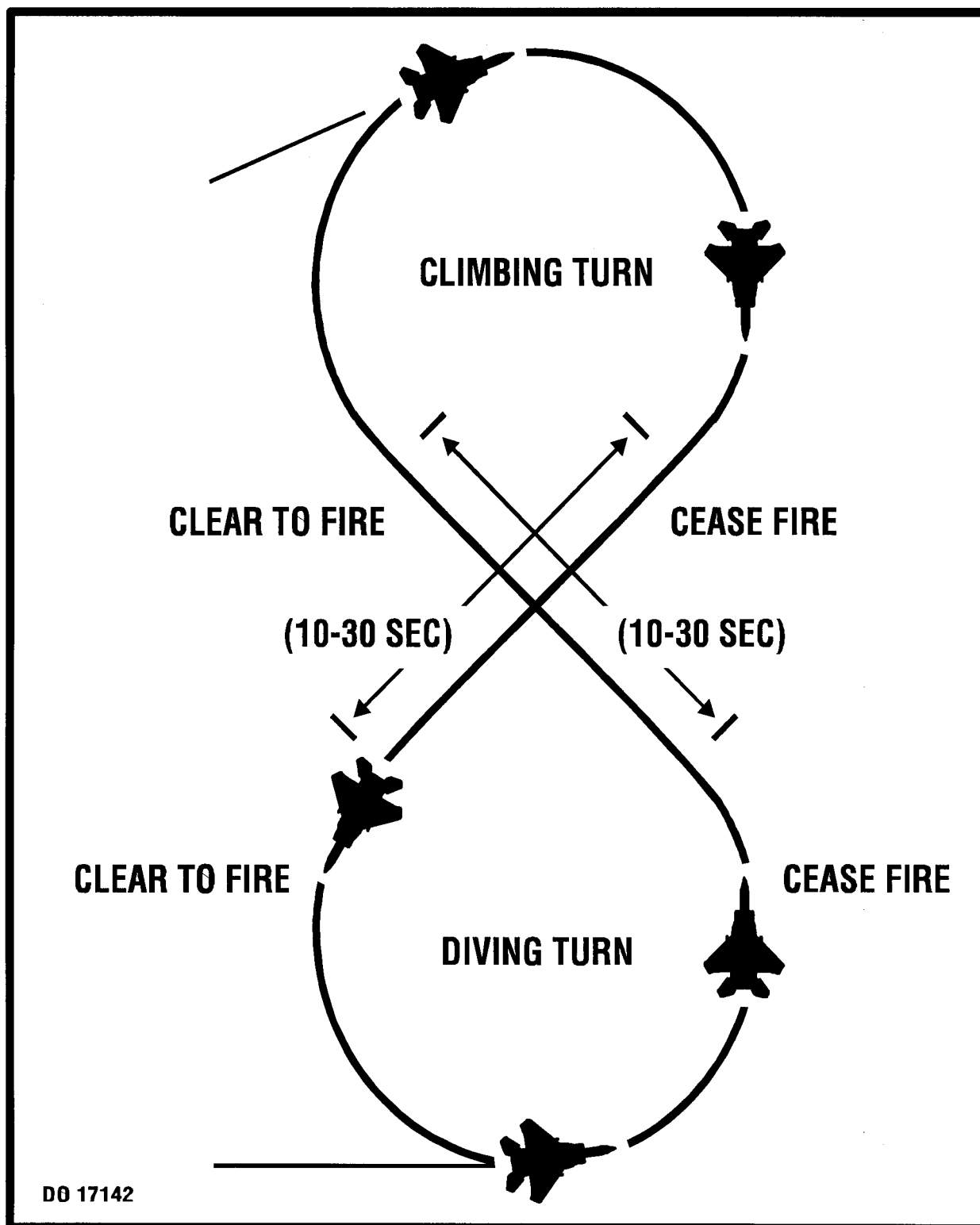
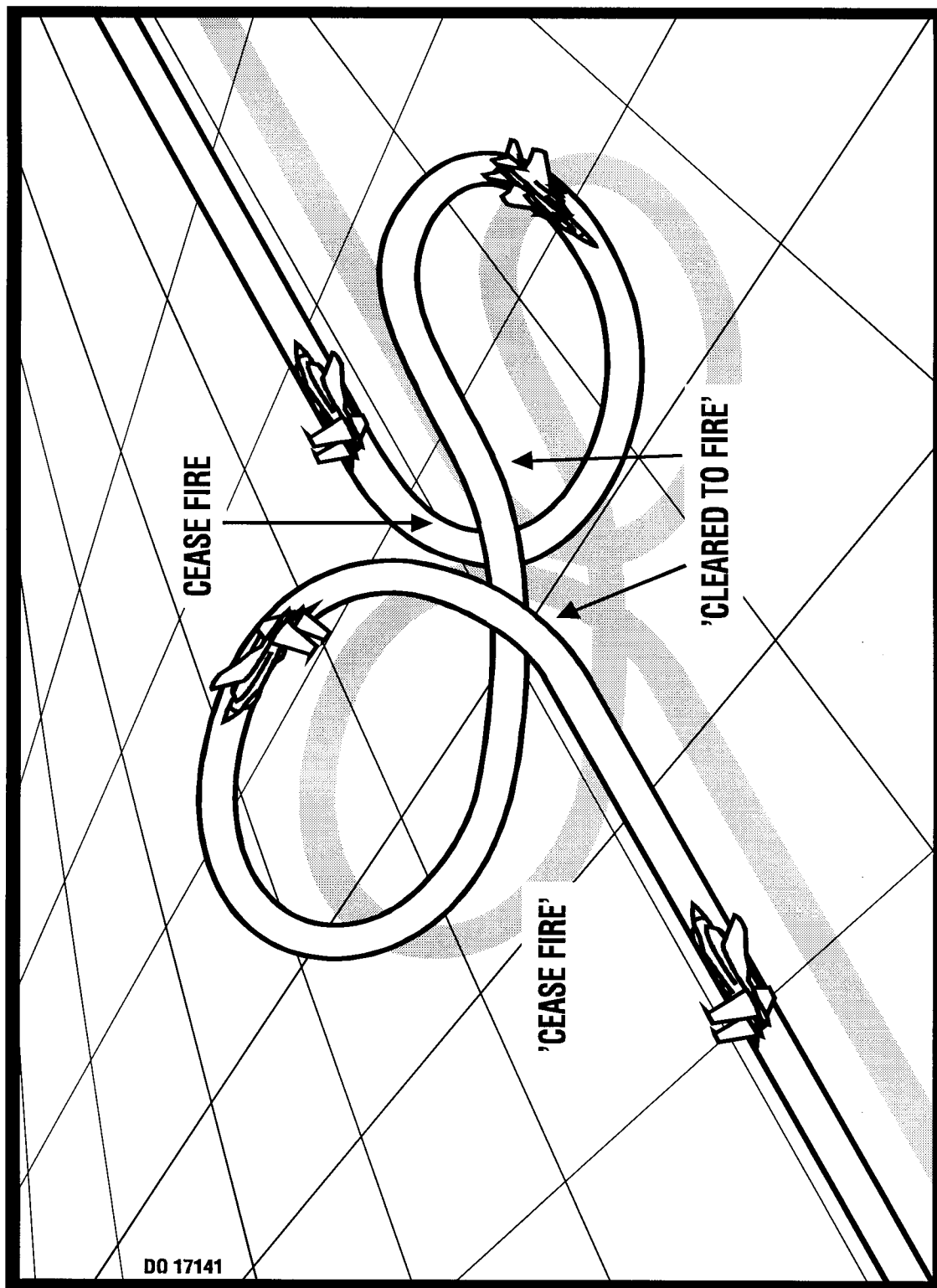


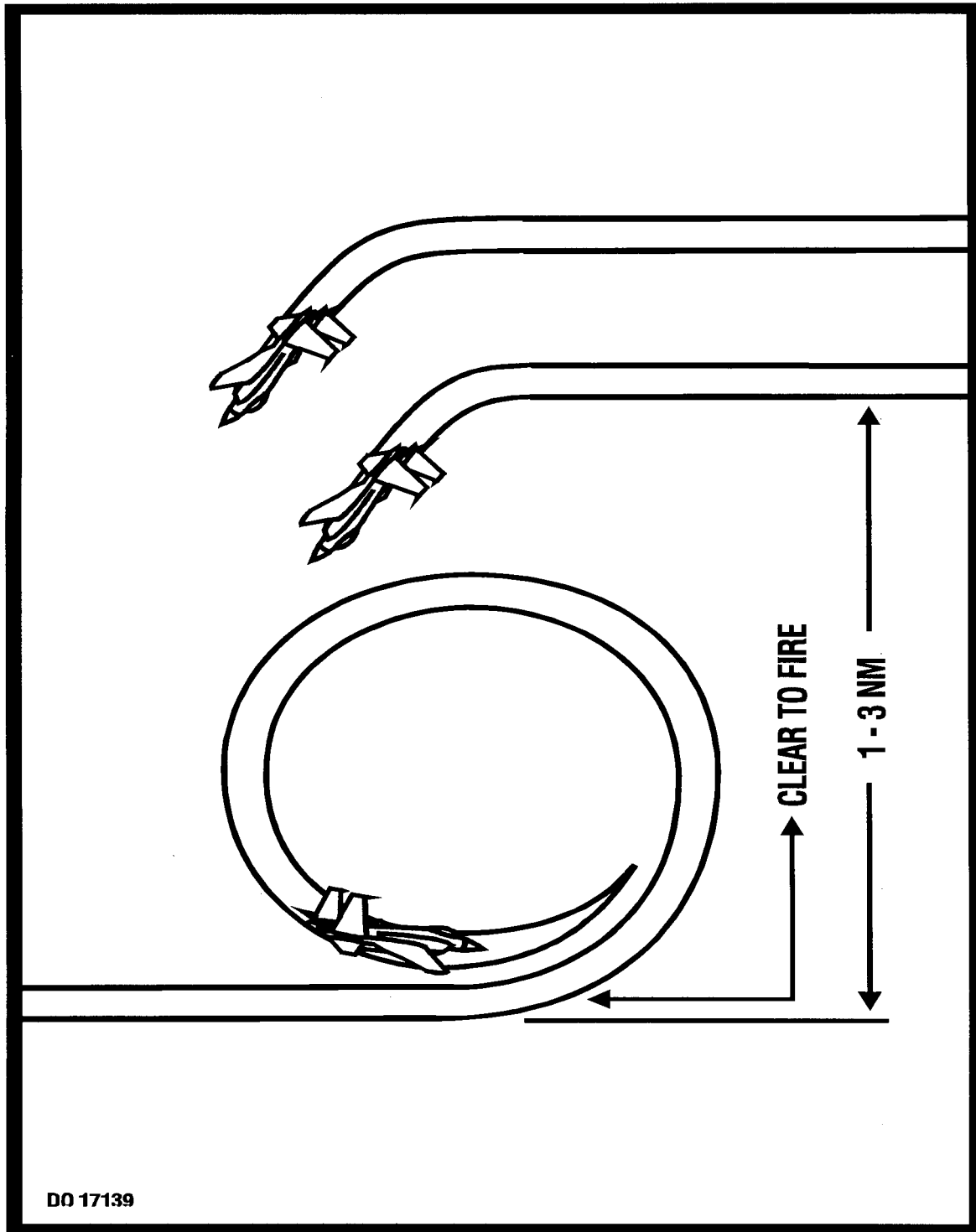
Figure A7.3. Typical Figure "8" Dart Pattern

Figure A7.5. Typical "Butterfly" Dart Pattern (2/2).



7.5. Typical "Butterfly" Dart Pattern (2/2).

Figure A7.6. Combat Dart Pattern.



A7.2. Live Missile Firing. This section applies to live missile firing exercises. Predeployment and deployment briefings will cover specific procedures, requirements, and restrictions.

A7.2.1. Terms Explained:

A7.2.1.1. Range Safety Officer. The Range Safety Officer is the individual responsible for monitoring all parameters of operations safety during live-fire missions. The Range Safety Officer normally operates out of Range Control.

A7.2.1.2. Mission Commander or Safety Chase. An aircrew member qualified to brief and control live missile firing missions. Acts as safety chase for firings.

A7.2.1.3. WD. A GCI or AWACS director who provides mission support assistance as dictated by the profile.

A7.2.2. General. The TRs of this chapter apply with the following additional restrictions and requirements:

A7.2.2.1. The mission commander will act as safety chase and will brief each aircrew member in detail regarding:

- Dash-34 Checklist items (ground checks).
- Pre-range checks.
- Telemetry procedures.
- Range procedures.
- Firing procedures.
- Launch procedures and parameters.
- Debris areas and FOD potential.
- Emergency procedures.

A7.2.2.2. Conduct all missile firings in appropriate air-to-air ranges under positive radar control. The mission commander will fly a chase formation position with the firing aircraft (shooter(s)).

A7.2.2.3. Implement procedures to ensure the range is clear of surface activity and other aircraft before firing over an undercast.

A7.2.3. Arming and Dearming. Follow locally established arming and dearming areas for live missile firing missions. Specific procedures for arming and dearming will be in local operating instructions (OIs).

A7.2.4. Firing Procedures:

A7.2.4.1. All members of the flight will clear the range area visually and check for surface activity while in the firing pattern (weather permitting).

A7.2.4.2. Members of the flight not engaged in firing will fly a position as directed by the mission commander. Conduct the flight to preclude any aircraft from entering an area forward of the shooter's 3/9 line when the Master Arm switch is in an armed position. Immediately safe the aircraft missile anytime another aircraft moves forward of the shooter's 3/9 line.

A7.2.4.3. Conduct firings to ensure that both launch, impact, and missile fallout all occur within the range safety footprint.

A7.2.4.4. After firing a missile, the flight will maneuver as necessary to clear possible debris.

A7.2.4.5. Shooters will change positions when cleared by the mission commander.

A7.2.4.6. The mission commander will advise the WD upon completion of armament safety checks and on clearing the range (if required).

A7.2.4.7. Even if observing a normal missile launch, visually inspect all shooter aircraft with another aircraft to search for damage.

A7.2.5. Communications. Exercise strict radio discipline to alleviate the risk of confusing transmissions. Normally only by the WD, mission commander, shooter, or range safety officer will make transmissions. This is not to preclude anyone from having knowledge of a dangerous situation transmitting a KIO or other appropriate warnings. Establish voice communications between the firing flight and range control facility before firing. Shooters must acknowledge all directions and be cleared by the range safety officer, through the safety chase, before firing. Along with the radio calls prescribed elsewhere in this regulation, use the following transmissions for air-to-air weapons system evaluation program (A/A WSEP) missions:

A7.2.5.1. "COMMIT": Call transmitted by the range safety officer, through GCI, to the shooter to intercept the target. The call allows the safety chase to issue clearance to arm after establishing formation criteria.

A7.2.5.2. "FENCE CHECK": Call transmitted by the safety chase allowing the shooter to arm the weapon system. The shooter will not place the Master Arm switch to ARM until cleared.

A7.2.5.3. "BANDIT, BANDIT": Call transmitted by the range safety officer, through GCI, to transfer range safety responsibility to the safety chase. The safety chase will clear shooters to fire when appropriate.

A7.2.5.4. "CLEARED TO FIRE": Call transmitted by the range safety officer or safety chase to the individual shooters after meeting all safety conditions and accomplishing all mandatory radio calls. This is the only transmission that allows shooters to fire their weapons. Clearance to fire is clearance to arm.

A7.2.5.5. "ARM SAFE": Call transmitted by the safety chase or range control facility. This call cancels clearance to fire. Shooters will safe their weapon system but may continue to engage.

A7.2.5.6. "CEASE FIRE": Call transmitted by the safety chase or range control facility. This call cancels clearance to fire. Shooter may remain armed and continue to maneuver.

A7.2.5.7. "VISUAL BOTH": Call transmitted by the supporting fighter during a two-ship engagement when having a tally on the engaged fighter and the chase aircraft.

A7.2.5.8. "FOX": Call transmitted by the shooter at weapons launch.

A7.2.5.9. "OFF SAFE": Call transmitted by the shooter to indicate coming off the target and saving the weapon system.

A7.2.6. Abnormal Procedures:

A7.2.6.1. If required, missiles will be "safe jettisoned" in the range area according to locally established instructions.

A7.2.6.2. Conduct jettison procedures to ensure both launch and missile fallout occurs within the range boundary.

A7.2.6.3. Hung ordnance and misfire procedures will be according to locally established procedures.

AIRCREW AND TERMINAL ATTACK CONTROLLER COORDINATION GUIDE

(Use for Face-to-Face, Telephonic, or In-Flight Coordination)

Section A—Robin**A8.1. Participants**

- Units
- Aircraft Types
- Call Signs/Mission Number

A8.2. Weather

- Forecast / Local Observation
- Sunrise/Sunset/ Moon Illum/Lux data
- Wx minimums

A8.3. Working Area**A8.3.1. Times****A8.3.2. Boundaries**

- Ground references
- Altitude restrictions
- Major terrain features

A8.3.3. Entry, Exit Points, and Routing**A8.3.4. CPs, IPs, ACAs, etc.****A8.3.5. Noise sensitive areas No fly areas****A8.3.6. Artillery locations****A8.4. Scenario/SPINS/Comm Plan****A8.4.1. Scenario, Mission, and Learning Objectives****A8.4.2. Situation****A8.4.3. Type ordnance (simulated/practice/live)****A8.4.4. ROE****A8.4.5. Comm Plan**

- Frequencies/Codewords
- Controlling agencies
- Arrival/Working/Departure frequencies
- Mandatory calls

A8.4.6. Surface Threats**A8.4.7. FEBA/FLOT****A8.5. General Information****A8.5.1. Ordnance/Weapons Data**

- Type/Fuzing
- Live Ordnance Procedures/Minimum Altitudes
- Safe Escape/Safe Separation/Min Safe Distances (for personnel) Fuse Arming/Frag Avoidance

A8.5.2. Target Marking

- Type
- Location/Marker-to-target line
- Code (s)
- Friendly marks

A8.6. FAC Procedures**A8.6.1. Callsign/Mission #/Terminal controller location****A8.6.2. Primary/Alternate Target Area**

- Description
- Frequencies

A8.6.3. TOT/Authentication

A8.6.4. Fighter-FAC Briefing

- Ordnance (Simulated/Practice/Live)
- Playtime

A8.7. FAC-Fighter Briefing

- Scenario Update
- Friendly Positions
- Nine-Line Briefing
- Additional Restrictions

A8.8. Target Description

- Location/Elevation
- Description
- Location of Enemy/Friendly Troops

A8.9. Attack Tactics

- Restrictions
- Axis
- Egress
- Reattack
- Abort

A8.10. Training Rules

A8.11. Knock-it-off Criteria:

A8.12. Contingencies

A8.12.1. Alternate Missions

A8.12.2. Weather

A8.12.3. Emergencies

- Hung ordnance/ Accidental/Inadvertent release
- Runaway gun
- Radio failure/No contact
- Loss of aircraft

Section B—DEBRIEFING

A8.13. Accomplishment of Mission/Learning Objectives

A8.14. Tactics Used

A8.15. Lessons Learned